Figure 5–43. Modified back-to-back (herringbone) storage pattern. (Note: This pattern allows items to be driven or maneuvered directly **into** *their* **locations** ***with minimal*** *handling.)*

Section 4. HAZARDOUS COMMODITIES

5-401. **General**

a. It is neither possible nor practical to provide a complete detailed item-by-item listing of hazardous materials and their storage compatibility characteristics, This section provides overall guidance for storage and handling of various types of hazardous commodities. (Chap. VI delineates safety requirements.) Methods of storing and handling of hazardous commodities are to be oriented towards facilities acceptable to provide the necessary fire and accident prevention/protection programs. Facilities utilized to store hazardous commodities will meet the criteria established by this section. Items not covered herein or by cm-rent service/agency directives should be researched for hazard characteristics in the following references

(1) Dangerous Properties of Industrial Materials, by N. Irving Sax (Reinhold Publishing Corporation, 450 W. 33rd St., New York, NY.

(2) NFPA Fire Protection Guide on Hazardous Materials (Pamphlets 325A, 325M, 49, 491F and 704M), National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

(3) Handbook of Industrial Loss Prevention by Factory Mutual (McGraw-Hill Handbook, 330 West 42nd Street, New York, NY 10036).

(4) OSHA Safety and Health Standards (29 CFR 1910).

b. Local procedures should be developed and coordinated with the installation Safety Officer or other appropriate personnel of the respective service for dealing with these items as they are brought into the inventory and made available for storage.

c. When there is a doubt as to the hazard, identity, and storage location of any item in stock, or any item to be stored, the installation fire department, Safety Officer, Industrial Hygienist, or other appropriate personnel of the respective service should be consulted for guidance.

d. If leakage or spillage of one of these items occurs and it has not been covered by local procedure, evacuate the immediate area and seek advice of the Safet y Officer or other appropriate personnel of the respective service prior to clean up or disposal operation.

5402. Radioactive Material

The handling of radioactive material involves serious health hazards. Receipt, storage, packaging, handling, shipment and disposal are covered in the joint services regulation, DLAM 4145.8/AR 700-64/ NAVSUPINST 4000.34/AFM 67–8/MCO P 4400.105, Radioactive Commodities in DOD Supply System. MIL STD–129, Marking for Shipment and Storage; MIL STD–1458, Radioactive Materials, Marking and Labeling of Items, Packages and Shipping Containers for Identification in Use, Storage and Transportation; and AFR 71–4/TM 38–250/NAVSUP PUB 505(Rev)/MCO P4030.19D/DLAM 4145.3, Preparation of Hazardous Materials for Military Air Shipment; code of Federal regulations (CFR) 49, and OSHA 1910.96 should be consulted when shipping radioactive materials. Mattera not covered by current service/agency directives or above reference should tie referred to the local Radiological Protection Officer or Safety Officer for specific instructions.

5–403. Materials With Explosive Characteristics

a. Many items have unsuspected inherent properties that are potentially dangerous and, although not listed as explosive or flammable when stored alone, may become hazardous when stored in proximit y to other items. For example, oils combined with liquid oxygen can cause an explosion.

b. Care must be exercized when handling these potentially dangerous items to assure storage is not in proximity to other items. If there is a doubt, the installation Safety Officer or fire department should be consulted for specific instructions.

c. For information in these matters not contained in current service/agency directives or in this regulation refer to the National Fire Protection Guide on Hazardous Materials (NFPA 325A, 325M, 49, 491M and 704M) published by the National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02110.

5–404. Flammable and Combustible Liquids

a. General. Storage of flammable and combustible liquids must consider stacking heights and distances between stacks. To provide these data, this paragraph defines classes of flammable and combustible liquids together with tables depicting the storage requirements.

b. Flammable and combustible liquids (29 CFR 1910.106).

(1) *Combustible liquids.* Any liquid having a flashpoint at or above 100° F. (37.8° C.). Combustible liquids are divided into two classes as follows: (29 CFR 1910.106(a)(18))

(a) *Class II liquids.* Liquids with flashpoints at or above 100° F. (37.8° C.) and below 140° F. (60° C.) except any mixture having components With flashpoints of 200° F. (93.3° C.) or higher, the volume of which makeup 99 percent or more of the mixture.

(b) Class III liquids. Those liquids with flashpoints at or above 140° F. (60° C.). Class III liquids are subdivided into two subclasses:

1 Class IIIA liquids. Those liquids with flashpoints at or above 140° F. (60° C.) and below 200° F. (93.3° C.) except any mixture having components with flashpoints of 200° F. (93.3° C.) or higher, the total volume of which make up 99 percent or more of the total volume of the mixture.

2 Class IIIB liquids. Those liquids with flashpoints at or above 200° F. (93.3° C.).

(2) *Flammable liquids. Any* liquid having a flashpoint below 100° F. (37.8° C.), except any mixture having components with flashpoints of 100° F. (37.8° C.) or higher, the total Of which make up 99 percent or more of the total volume. Flammable liquids are categorized as class I liquids. Class I liquids are divided into three classes as follows:

(a) *Class IA liquids.* Those liquids having flashpoints below 73° F. (22.8° C.) and having a boiing point below 100° F. (37.8° C.).

(b) *Class IB* liquids. Those liquids having flashpoints below 73° F. (22.8° C.) and having a boiling point at or above 100° F. (37.8° C.).

(c) *Class IC liquids.* Those liquids having flashpoints at or above 73° F. (22.8° C.) and below 100° F. (37.8° C.).

c. Tables (indoor storage) (29 CFR 1910.106 Table H-14).

d. *Warehouses or* storage *buildings for flammable and combustible liquids (29 CFR 1910).*

(1) If the storage building is located 50 feet or less from a building or line of adjoining property that may be built upon, the exposing wall will be a blank wall having a fire-resistance rating of at least 2 hours.

(2) The total quantity of liquids within a building will not be restricted but the arrangement of storage will comply with table 5-1 or 5-2.

(3) Containers in piles will be separated by pallets or dunnage where necessary to provide stability and to prevent excessive stress on container walls.

(4) Portable tanks stored over one tier high will be designed to nest securely, without dunnage, and adequate MHE will be available to handle tanks safely at the upper tier level.

(5) No pile will be closer than 3 feet to the nearest beam, chord, girder, or other obstruction? and will be 3 feet below sprinkler deflectors or discharge orifices of water spray, or other overhead fire protection systems.

(6) Aisles of at least 3 feet wide will be provided where necessary for reasons of access to doors, windows or standpipe connections.

e. *Tables (outdoor storage) (29 CFR 1910.106 Table* H-16).

Table 5-1. Indoor container storage.

class liquid	Storage level	*Protected storage maximum per pile* Gallons	Height	*Unprotected storage maximum per pile* Gallons	Height
IA	Ground and upper floors	2,750 (50)	3 ft (1)	600 (12)	3 ft (1)
	Basement	Not permitted		Not permitted	
IB	Ground and upper floors	5,500 (loo)	6 ft (2)	1,375 (25)	3 ft (1)
	Basement	Not permitted		Not permitted	
IC	Ground and upper floors	16,500 (300)	6 ft (2)	4,125 (25)	3 ft (1)
	Basement	Not permitted		Not permitted	
II	Ground and upper floors	16,500 (300)	9 ft (3)	4,125 (75)	9 ft (3)
	Basement	5,500 (loo)	9 ft (3)	Not permitted	
III	Ground and upper floors	55,000 (1,000)	15 ft (5)	13,750 (250)	12 ft (4)
	Basement	8,250 (450)	9 ft (3)	Not permitted)	

Note 1. When 2 or more classes of materials are stored in a single pile, the maximum gallonage permitted in that pile will be the smallest of the 2 or more separate maximum gallonages.

Note 2. Aides will be provided so that no container is more than 12 feet from an aisle. Main aisles will be at least 8 feet wide and side aisles at least 4 feet wide. (Numbers in parentheses indicate corresponding number of 55-gallon drums.)

Note 3. Each pile shall be separated from each other by at least 4 feet.

*A sprinkler or equivalent fire protection system installed in accordance with NFPA standard 30.

Table 5-2. Indoor portable tank storage.
(29 CFR 1910.106 Table H-15).

Class liquid	Storage level	Protected storage maximum per pile Gallons	Protected storage maximum per pile Height	Unprotected storage maximum per pile Gallons	Unprotected storage maximum per pile Height
IA	Ground and upper floors	Not permitted		Not permitted	
	Basement	Not permitted		Not permitted	
IB	Ground and upper floors	20,000	7 ft	2,000	7 ft
	Basement	Not permitted		Not permitted	
I C	Ground and upper floors	40,000	14 ft	5,500	7 ft
	Basement	Not permitted		Not permitted	
H	Ground and upper floors	40,000	14 ft	5,500	7 ft
	Basement	20,000	7 ft	Not permitted	
III	Ground and upper floors	60,000	14 ft	22,000	7 ft
	Basement	20,000	7 ft	Not permitted	

Note *1*. When 2 or more classes of materials are stored in a single pile, the maximum gallonage permitted in that pile will be the smallest of the 2 or more separate maximum gallonages.

***Note 2*. Aisles will be provided so that no portable tank is more than 12 feet from an aisle. Main aisles will be at leaat 8 feet wide and side aisles at least 4 feet wide.**

Note *3*. Each pile will be separated from each other by at least 4 feet.

Table 5-3. Outdoor container storage.

Class	2 Maximum per pile (see note 1) Gal	3 Distance between piles (see note 2) Ft	4 Distance to property line that can be built upon (see notes S and 4) Ft	5 Distance to street, alley, public way (see note 4) Ft
IA	1,100	5	20	10
IB	2,200	5	20	10
IC	4,400	5	20	10
II	8,800	5	10	5
III	22,000	5	10	5

***Note 1*. When 2 or more classes of materials are stored in a single pile, the maximum gallonage in that pile will be the smallest of the 2 or more separate gallonage.**

Note *2*. Within 200 feet of each container, there will be a 12-foot wide access way to permit approach of tire control apparatus.

Note *3*. The distances listed apply to properties that have protection for exposures as defined. If there are exposures, and such protection for exposures does not exist, the distances in column 4 will be doubled.

Note 4. When total quantity stored does not exceed 50 percent of maximum per pile, the distances in columns 4 and 5 may be reduced 50 percent, but not less than 3 feet.

Table 5-4. Outdoor portable tank storage. (29 CFR 1910.106 Table H-17)

1	2	3	4	5
class	Maximum per pile	Distance between piles	Distance to property line that can be built upon	Distance to street, alley, public way
	Gal	Ft	Ft	Ft
IA	2,200	5	20	10
IB	4,400	5	20	10
IC	8,800	5	20	10
II	17,600	5	10	5
111	44,000	5	10	5

Note 1. **When 2 or more classes of materials are stored in a single pile, the maximum gallonage in that pile will be the smallest of the 2 or more separate gallonage.**

Note .$?. Within 200 feet of each portable tank, there will be a 12-foot wide access way to permit approach of fire control apparatus.

Note 3. **The distances listed apply to properties that have protection for exposures defined. If there are exposures, and such protection for exposures does not exist, the distances in columns 4 will be doubled.**

Note 4. When total quantity stored does not exceed 50 percent of maximum per pile, the distances in columns 4 and 5 maybe reduced 50 percent, but not less than 3 feet.

f. Spill containment. The outdoor storage area will be graded in a manner to divert possible spills away from buildings or other exposures or will be surrounded by a curb at least 6 inches high. When curbs are used, provisions will be made for draining of accumulations of ground or rain water or spills of flammable or combustible liquids. Drains will terminate at a safe location and will be accessible to operation under fire conditions.

g. *Fire* control. Suitable fire control devices, such as small hose or portable fire extinguishers, will be available at locations where flammable or combustible liquids are stored.

(1) At least one portable fire extinguisher having a rating of not less than 12-B units will be located outside of, but not more than 10 feet from, the door opening into any room used for storage.

(2) At least one portable fire extinguisher having a rating of not less than 12-B units must be located not less than 10 feet, nor more than 25 feet, from any Class I or Class 11 liquid storage area located outside of a storage room but inside a building (29 CFR 1910.106(d)(7)(i)).

h. Warehouse design for storage of flammable/combustible material.

(1) The building will be a single purpose structure, of noncombustible or fire-resistant construction, one story in height without basement or crawl space, detached, and separated from other buildings by at least 50 feet, or as specified by the respective service. The building will be divided into individual compartments or stock rooms not to exceed 20,000 square feet in areas by means of standard fire walls (fig. 5–45). In addition, a method of exhaust ventilation should be installed as recommended by the respective service. Ventilation will be located in the building in accordance with ventilation engineering standards.

(2) Electrical installations will be in accordance with Class I, Division 2, as defined in Article 500 of the National Electric Code.

(3) Automatic sprinkler protection will provide a discharge floor density of 0.5 gallons per minute/square feet of floor space.

(4) Low level ventilation will be installed to provide .25 cubic feet per minute/square feet of floor area. This ventilation is designed to preclude the accumulation of toxic or explosive mixtures.

(5) Building will be provided with suitable floor drains or wall scuppers to expedite the removal of water discharged from sprinklers and hose streams. If floor drains are used, they will be connected to an appropriate dry well or holding tank and not to a sanitary sewer system *or* storm sewer.

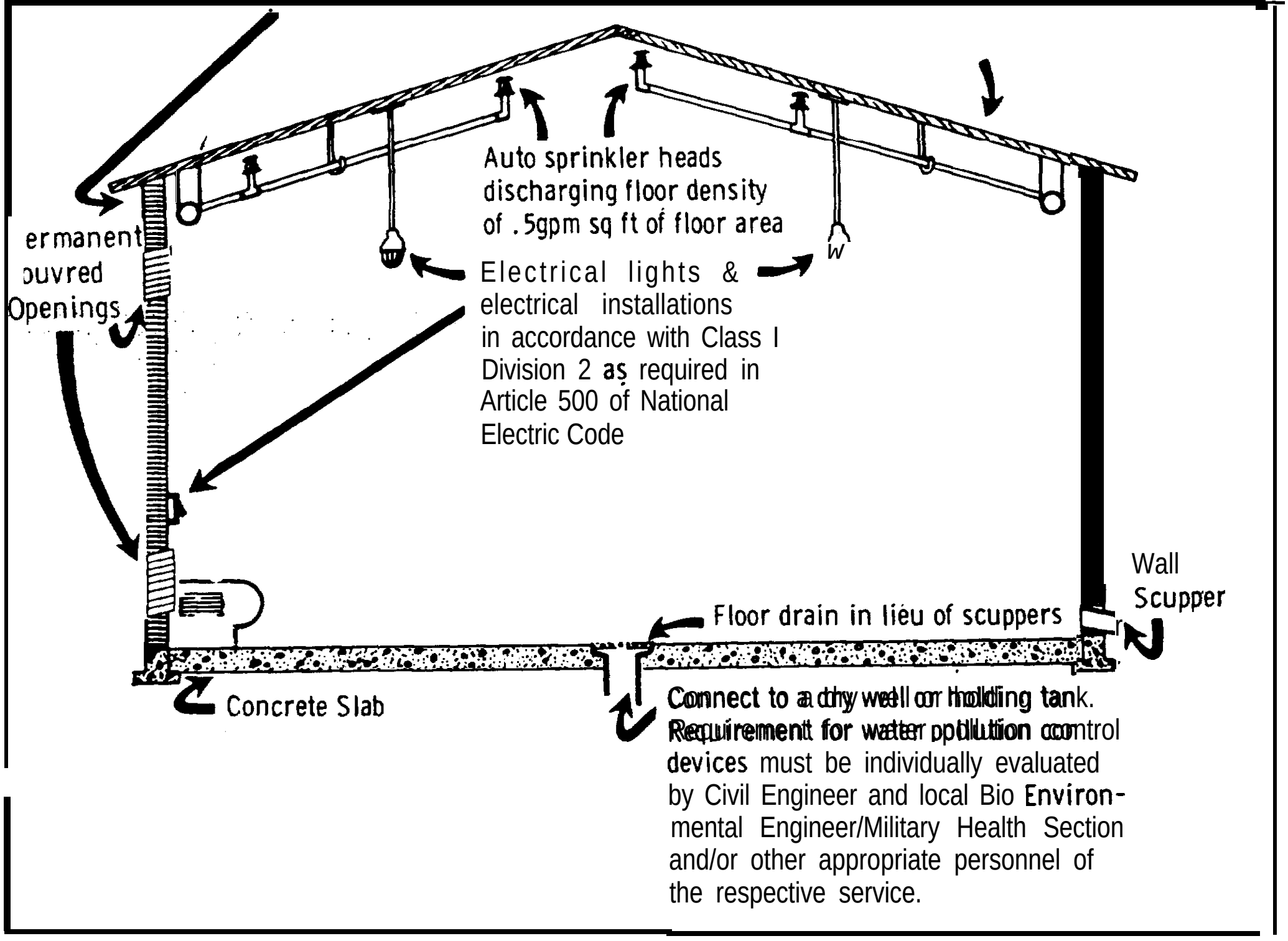


Figure 5–45. Flammable storage warehouse.

i. Flammable/combustible storage procedural guidelines.

(1) *General guidelines.*

(a) Open flame devices will not be used in the flammable storage facility. Avoid storing items against pipes or coils producing heat.

(b) Combustible materials, other than the wood pallets used in the storage of flammable commodities, will not be stored in the facility.

(c) The NO SMOKING rule will be rigidly enforced.

(d) Paint drums stored horizontally should be rolled half a turn periodically, preferably every 90 days. (It is not necessary to roll drums containing thinners.)

(e) Handling of all stock should be conducted so as to avoid damage to labelling.

Caution. Relabeling of materials whose original labels have been obliterated must be done with utmost caution to avoid mislabeling with consequent danger of misuse or waste of materials.

(f) When materials are received for storage, they will be checked for date of manufacture and, in the case of mandatory shelf life material, for shelf life expiration date. Materials received without date of manufacture labelling will be marked with shipping document date. This date will then serve as the manufacture date for purposes of age control.

(2) *Gasoline motorized industrial vehicles* will be prohibited from use in the flammable storage facility. Industrial trucks approved for use in hazardous locations will be used.

(3) *Container* bundling *guidelines.*

(a) Containers will be handled with extreme care to prevent rupture or breakage.

(b) Containers will be inspected for leaks before being placed in storage and will be inspected periodically while in storage.

(c) Leaking containers will be removed from the storage area immediately upon discovery and isolated from other stocks in a well ventilated area in preparation for disposal or repackaging as applicable.

(d) Containers will be stored in a manner which will enable issue or use in the order of dates of manufacture, with material bearing the oldest date issued first.

(e) Hazardous materials in any quantity will not be stored in open containers.

(f) Containers of paint should be palletized before storing.

(g) Extra precautions should be taken **to protect stored aerosol containers from heat. It is advisable to store aerosols in a well ventilated location in case of pressure releases of vapors due to container damage, valve leakage, etc. Since many materials packed in aerosols have short shelf life, ready accessibility for age inspection, etc., should be a condition of storage.**

(h) Containers also include ISO/ANSI containers of lengths from 20 feet to 40 feet and a width of 8 feet.

Warning. **Aerosals are packed at pressures up to 70 psi. Heat can increase internal pressures to the bursting point. Do not store aerosols in temperatures exceeding 120° F. Keep out of direct sunlight and away from other heat sources which may generate such temperatures.**

5–405. Compressed Gases

a. Types of gas. For the purpose of a better understanding of this section the following gases are described.

(1) *Compressed gas. Any* material or mixture having in the container an absolute pressure exceeding 40 psi (pounds per square inch) at 70° F. or regardless of the pressure at 70° F. having an absolute pressure exceeding 104 psi at 130” F.; or any liquid flammable material having a vapor pressure exceeding 40 psi at 100° F. as determined by ASTM Test D-323.

(2) ***Liquified*** *gas.* A gas which, under the charged pressure, is partially liquid at a temperature of 70° F.

(3) *Flammable gas.* Classified as “flammable compressed gas” if any of the following occurs: . . . . . .

(a) Either a mixture of 13 percent or less (by volume) with air forms a flammable mixture or the flammable range with air is wider than 12 percent regardless of the lower limit. These limits will be determined at atmospheric temperature and pressure. The method of sampling and test procedures will be acceptable to the Bureau of Explosives.

(b) Using the Bureau of Explosive’s flame projection apparatus, the flame projects more than 18 inches beyond the ignition source with the valve fully opened *or* the flame flashes back and burns at the valve with any degree of valve opening.

(c) Using Bureau of Explosive’s open drum apparatus, there is any significant propagation of flame away from the source.

(d) Using the Bureau of Explosive’s closed. drum apparatus, there is any explosion of the vapor-air mixture in the drum.

(4) ***Toxic*** *gas. All gases* that are hazardous to life or health under normal conditions.

b. Hazards.

(1) Care in handling. Because compressed gases are under pressure, such gases must be handled with extreme care, particularly the flammable and explosive gases. Compressed gas cylinders must never come in contact with fire, sparks, or electrical circuits. An exploded steel container would have the same destructive effect as a bomb explosion.

(2) *Anesthetic gases.* Some gases are anesthetic when inhaled, and, when absorbed in the blood, exert a drug-like action. The inhalation of considerable quantities can cause death.

(3) ***Irritant*** gases. Irritant gases are not absorbed into the blood, but when inhaled, injure the surface tissue of the breathing passages. Death may result from continuous exposure because of the contraction of the respiratory tract. Examples of irritant gases are chlorine, sulphur dioxide, and ammonia.

(4) ***Asphyxiating*** *gases.* Some gases are considered harmless in small quantities, but inhaling large quantities of gases that prevent oxygen from reaching the lungs can cause suffocation. Examples of such gases are nitrogen, hydrogen, and helium.

c. General *precautions.* General precautions for handling and storing compressed gases are as foi-10WX (29 CFR 1910.101; 191O.1W, 191o.1W, 1910.104; 1910.105; 1910.111).

(1) Identification of cylinders will bear color code of noun in accordance with MIL STD-101. Filled cylinders will be tagged/labelled with two stock numbers-one for the gas and one for the cylinder. The empty cylinder tag will be over-stamped "MT" to designate "empty."

(2) Gases should be referred to by proper name, rather than just "gas."

(3) Safety devices in valves of cylinders (fig. 5-46) will not be tampered with.

(.4) Normally, cylinders will not be handled, shipped or stored without valve protection caps. However, small cylinders of less than 40-pound capacity, "ram-bottom" type cylinders, and cylinders with less than 625 cubic inches of volumetric capacity, such as, carbon dioxide and medical gases, do not require valve protection covers.

(5) The valve outlet connectors of both full and empty cylinders must have an authorized dust cap.

(6) Oxygen cylinders must be free from grease or oil.

(7) Numbers of markings that are stamped on cylinders will not be altered or defaced nor will additional markings be applied to cylinders without proper approval.

(8) For storage and handling purposes, all cylinders will be considered full and corresponding care must be exercised.

(9) Empty cylinders will be stored separately but in the same manner as full cylinders. Therefore, empty cylinders will not be stored with full cylinders on the same pallet or in the same stack. Cylinders will not be lifted by the valve protection cap.

(10) Cylinders will not be lifted by cranes or mechanical lifts unless fastened in proper containers, racks, and cradles. Rope and chain slings and electromagnets will not be used to lift cylinders.

(11) Cylinders will not be used as rollers, supports, or for any purpose other than for containing compressed gases.

(12) Compressed gas will not be used to dust Off clothing.

(13) Flames will not be used to test for leaks in compressed gas cylinders.

(14) Valves on empty cylinders will be kep. closed.

(15) Cylinder valves will be closed before moving cylinder.

(16) Suitable materials handling equipment will be used for lifting and transporting cylinders.

(17) Suitable hand trucks should be provided for conveying cylinders; cylinders moved on hand truck must be held securely in position.

(18) When suitable hand trucks are not available, cylinders will be moved by tilting and rolling

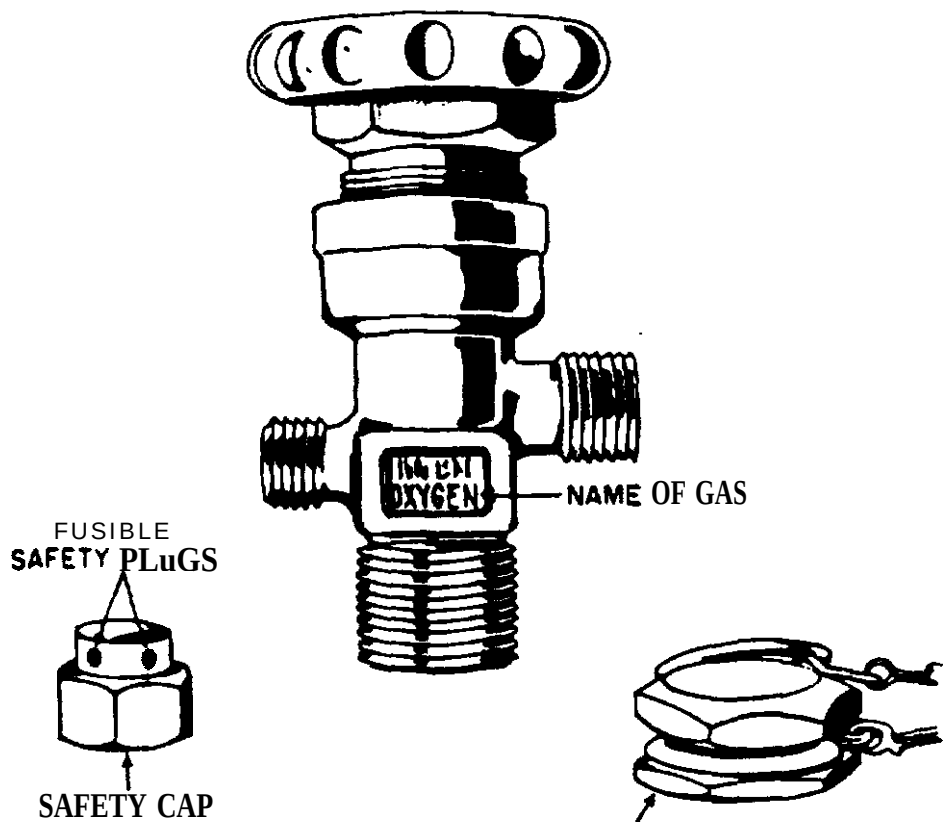


Figure 5-46. View 1. Oxygen cylinder valve.

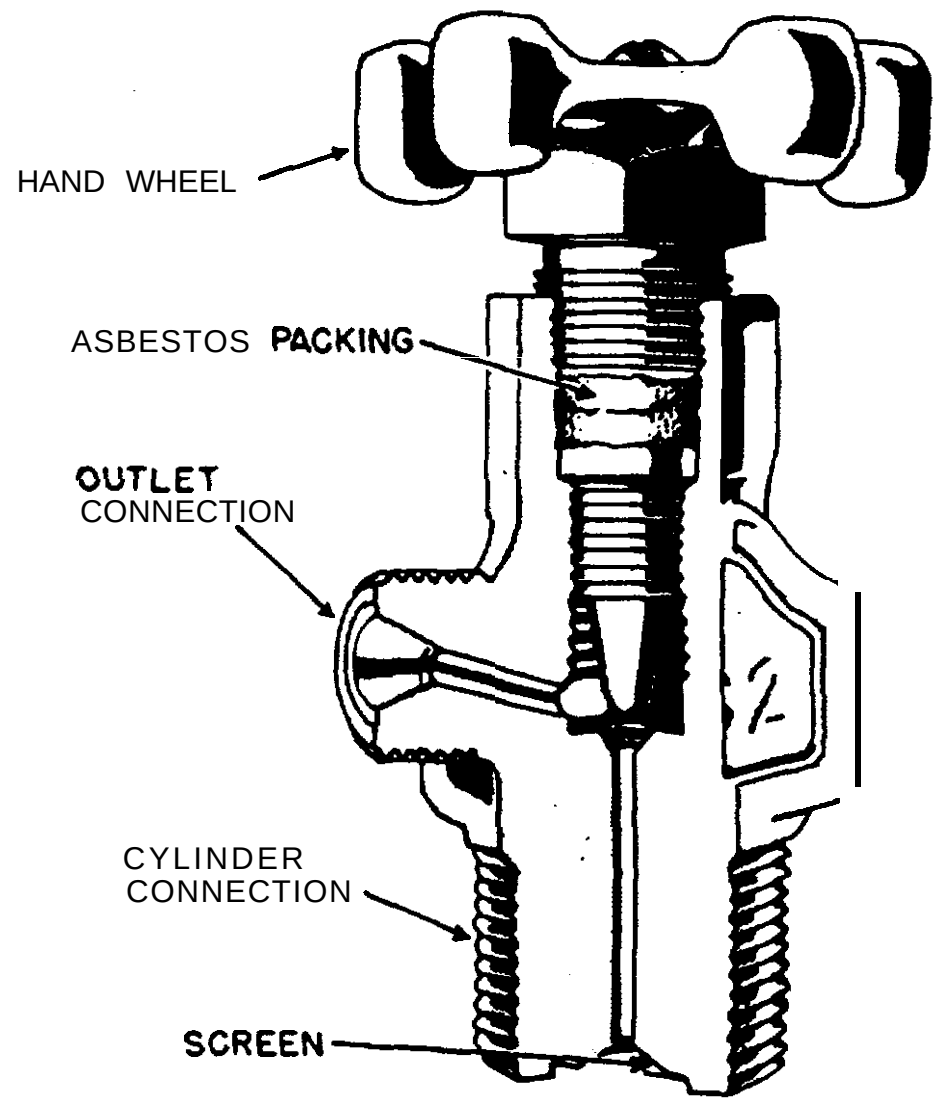


Figure 5-46. View 2. Cutaway view of acetylene cylinder valve.

on the bottom edge. Do not drag or slide the cylinders.

(19) Cylinders to be transported in trucks, rail cars, or ships will be braced securely to avoid overturning or moving.

(20) Cylinders will not be dropped or permitted to strike against each other violently.

(21) Any cylinder of compressed gas which is not definitely identifiable as to contents will not be issued until the content is identified.

(22) "NO SMOKING" signs will be posted, and smoking prohibited in or around compressed gas storage sheds,

d. Storage criteria *for gas cylinders.*

(1) Storage *facility design.* The following criteria will apply to all cylinder storage of compressed gases. Future construction of structures for storage of these gas cylinders must meet these criteria and should be examined by safety personnel to verify conformity with safety standards prior to acceptance by supply.

(a) Roofed, open-sided shed storage on a concrete slab, above grade, is the preferred type of storage facility if climatic conditions are favorable and security precautions are adequate,

(b) All storage facilities for compressed gases will be separated from other buildings by at least 50 feet.

(c) Flammable gases and gases which support combustion must be stored in separate sheds with a distance of at least 50 feet between sheds.

(d) Preferably, sheds should be constructed of light, noncombustible materials.

(e) If one or more sides are installed, provisions must be made to insure a complete change of air at least six times each hour.

(f) All electrical installation will be in accordance with Class I, Division 2 locations as defined in Article 500 of the National Electrical Code. The' use of skylights is recommended to decrease the need for electrical connections.

(g) Sheds will not be heated. The use of stationary or rotating roof vents may be necessary to lower the temperature near the ceiling to ambient conditions during warm weather.

(2) Enclosed storage facilities will meet the following criteria

(a) A single story building, above grade, must be utilized.

(b) Separate storage rooms or compartments must be constructed for flammable gases and for gases which support combustion. Additional compartments for specific types of gases may also be constructed,

(c) The walls, partitions, floors, and ceilings will be of noncombustible, nonporous material. All walls and partitions will be continuous from floor to ceiling, and will be securely anchored and sealed with mineral wool, rubberized grouting, or other nonporous sealant. At least one wall of each storage room or compartment, for combustible gases, must be on an exterior wall.

(d) It is recommended all doors to storage rooms or compartments be directly through exterior walls. All doors to storage areas will have a fire resistance rating of at least 1½ hours. All doors to storage areas from interior parts of the building (when necessary) will be protected by a swinging type, self-closing fire door for Class B openings.

(e) Windows will be wired glass with approved metal frames and fixed sash. Installation will be in accordance with Standards for the Installation of Fire Doors and Windows, NFPA 80.

(f) Every inside storage room or compartment will be provided with either a gravity or a mechanical exhaust ventilation system or a combination of each type. Such systems will be designed to provide for a complete change of air within each room or compartment at least six times per hour. Where gravity ventilation is provided, the fresh air intake as well as the exhaust outlet from the room or compartment will be on the exterior roof or exterior wall of the building in which the room is located. Provisions will be made for exhaust outlets to accommodate gases heavier than air and lighter than air, Exhaust outlets for heavier than air gases will be within 6 inches of the floor. If a mechanical exhaust system is used, it will be controlled by a switch (manual or automatic) located outside the door of the storage room.

(g) All electrical installations will be in accordance with Class 1, Division 2, locations as defined in Article 500 of the National Electrical Code (NFPA 70).

(3) A fire suppression system for shed and enclosed storage should be installed if the cost of the facility and stored material indicates a need. If temperatures reach the freezing point of water, a dry-pipe sprinkler system should be used. If temperatures do not reach freezing, an automatic wet-pipe sprinkler system should be installed in accordance with NFPA Standard 13. Either system should de-

liver an application density of 0.50 gallons per minute per square foot for a minimum area of 2,000 square feet. The sprinkler heads installed should meet Factory Mutual Laboratory requirements for large water-drop equipment. A water flow discharge from the sprinkler system must transmit an alarm to central fire department receiving equipment. Scuppers or floor drains should be provided to remove discharged water in enclosed storage facilities.

e. Protective equipment. Where irritant gases. such as ammonia and sulfur dioxide are present in nuisance or light concentrations, gas tight goggles and respiratory protective devices, or full face mask respiratory protective devices should be worn. When entering areas known to be highly contaminated or when rescuing personnel from gassed areas, rescuers will be properly equipped with self-contained breathing apparatus or other appropriate respiratory equipment. Mechanical filter respirators offer no protection against high percentages of gas concentrations and should not be used. *When* entering areas containing hazardous concentrations of atmospheric contaminants, *necessary* protective equipment will be worn as prescribed by the installation Safety Officer. Personnel shall be trained in the use and care of respiratory protective equipment and in inspection for operational capability. This training will be the responsibility of the installation fire department or appropriate personnel of the respective service. A good reference is the American National Standards Institute (ANSI) Z88.2–1969, Practices for Respiratory Protection. Additional guidance on the storage and handling of compressed gases and gas cylinders is provided in DLAR 4145.25 /AR-700-68 /NAVSUPINST 4440.128B/MCO 10330 .2B/AFR 67-12, Storage and Handling of Compressed Gases and Gas Cylinders.

5–406. Acids

a. The following fire protection and safety criteria will apply to bulk storage of acids (fig. 5-47).

(1) Building should be one story in height of noncombustible *or* tire-resistant construction and should be equipped with automatic sprinkler protection. If the building has sprinklers, it will be equipped with either floor drains or wall scuppers.

(2) Buildings will be heated to prevent freezing of certain acids. Ventilation will be provided by means of permanent louvered openings at floor and ceiling levels or other accepted gravity ventilation methods.

(3) Electrical installation may be for general purpose requirements.

(4) Protective clothing, eye wash, deluge shower, and self-contained breathing apparatus will be readily available for operating personnel. Personnel shall be trained in the use and care of respiratory protective equipment and in inspection for operational capability. This training will be the responsibility of the installation fire department or appropriate personnel of the respective service.

b. Typical acids that can be stored in the acid facility include:

Hydrochloric (Muriatic) Acid.
Nitric Acid.
Sulphuric Acid.
Phosphoric Acid.

c. Different acids will be stored separately in designated areas. In lieu of aisle space, noncombustible barriers up to a minimum of 3 feet high and sealed at the floor level may be used to obtain maximum storage space.

d. "NO SMOKING signs will be posted and smoking prohibited in or near acid storage buildings.

e. Acids are among a group of materials that are injurious to personnel because of their corrosive qualities. Care must be taken to prevent any spillage or container breakage which could permit contact to skin, eyes, or inhalation into lungs of personnel working with such material.

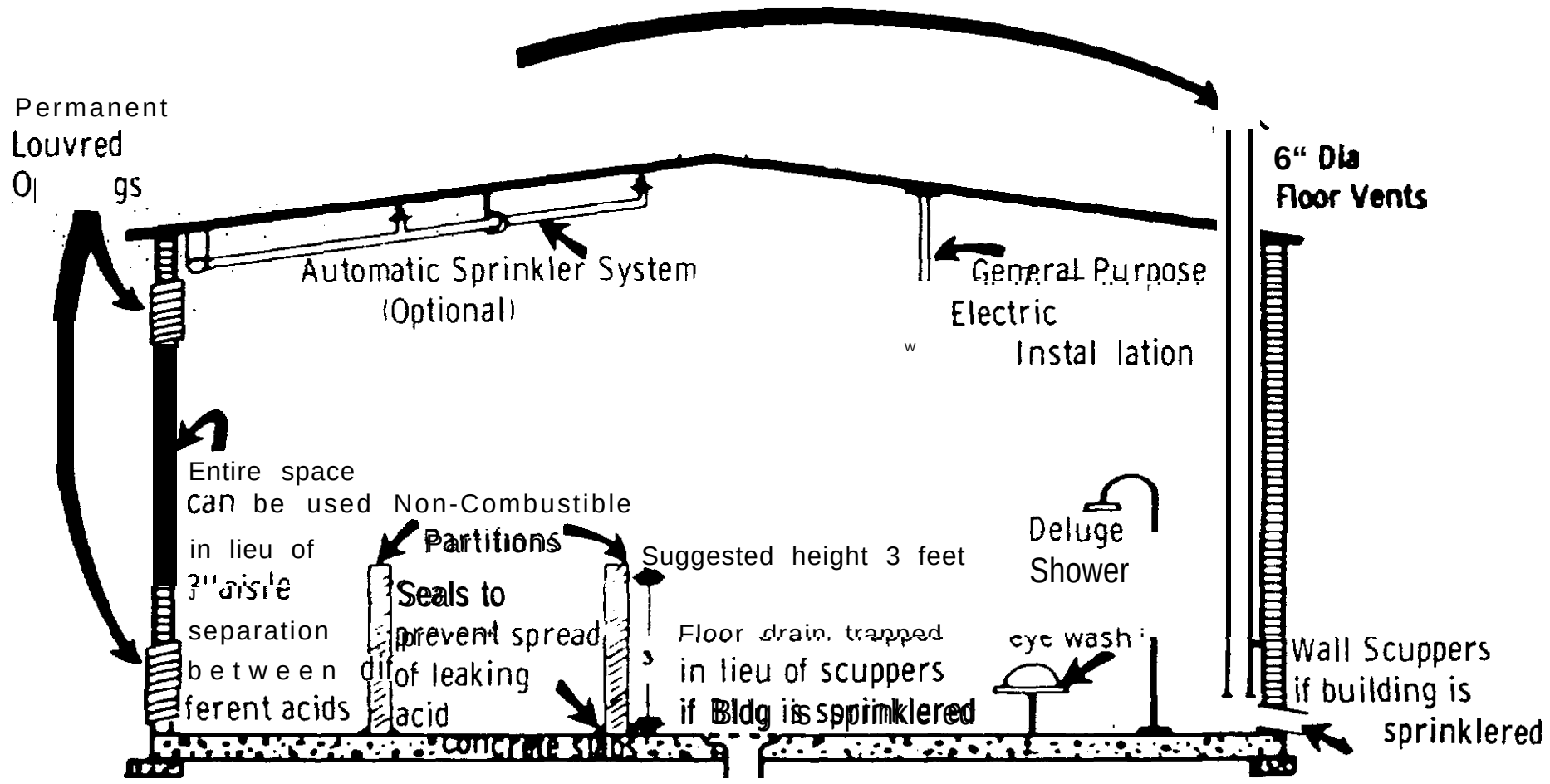
5–407. Table of Hazardous Materials (Table 5–5)

a. The table lists many of the items contained in current DOD Stock Lists and stored at DOD installations. The hazard identity column provides planning guidance to fire departments for safe tactical procedures in emergency situations by providing on-the-spot information to safeguard the lives of fire fighting personnel.

b. Under conditions of leakage or spillage, items with a health or reactivity rating of 2, 3, or *4* are dangerous to personnel not wearing proper protective equipment.

c. Items marked with double asterisks in the table indicate radioactive materials. Consult with the Radiological Protection Officer *or* the Safety Officer for specific instructions.

d. Items not covered in the table should be researched for hazard characteristics in the applicable service *or* agency publications.



Note: Strong oxiziding acids such as perch loric and nitric acids should be seperated from organic acids such as acetic acid.

Figure 5–47. Acid storage warehouse.

Table 5–5. Hazardous Materials Storage and Handling Criteria

(See notes at end of table for explanation of codes.)

Noun	Hazard Identity				Storage and Handling	Storage Comp Group	Separation Requirement	Type of Storage				Portable Fire Extinguisher Type	Class Liquid
	Health	Flammability	Reactivity	Specific Hazard				Flamm Stge Bldg	Acid Stge Bldg	Comp Gas Stge Bldg	Gen Purpose Whse		
Acetaldehyde	2	4	2	O	Store in end of building to aid fire fighting.	A	4' aisle space	X		-	-----	2a–3	IA
Acetic Acid	2	2	1		Separate from chromic acid, nitric acid and sodium peroxide.	B	Minimum of 4' aisle space	--	×	-	-----	1–2a–3	II
Acetic Acid Anhydride (See Acetic Anhydride).													
Acetic Acid (Glacial) (See Acetic Acid).													
Acetic Anhydride	2	2	2	E	Protect against physical damage.	A	4' aisle space	X	--		-----	2a–3	II
Acetone	1	3	0			A							
Acetone Cyanohydrin	4	1	2	OO	Protect against physical damage.	A	4' aisle space from class I flammables.	×	-----	-- -	-----	2a–3	III
Acetonitrile	2	3	1	O	Protect against physical damage.	A	4' aisle space	×	-----	-----	-----	2a–3	IB
Acetyl Chloride	3	3	2	H	Protect against physical damage.	A	None	×	-----	-----	-----	2a–3	IB
Acetyl Oxide (See Acetic Anhydride)													
ACETYL PEROXIDE (25%)	1	2	4	D	Special storage and handling.	E	4' aisle space	-----	-----		-----	-------	II
Acetylene	1	4	3	O	Separate from oxygen and other flammable gases. Store upright.	C	Solid wall compartment or separate building.	-----	-----	×	-----	1–3	IA
Acetylene (in Acetone)	1	4	2										
Acetylene Dichloride	2	3	2	OO	Protect against physical damage.	A	None	X	-- --	- ---	-----	2–3	IB
Tetrabromide	3	0	1	0	Protect against physical damage.	D	3' aisle space	---	-----	-----	X	1	
	3	3	2	O	Store in end of building to aid fire fighting.	A	4' aisle space	X	-----	-----	-----	1–2a–3	IB
Acrolein Dimer	1	2	1	O	Store in end of building to aid fire fighting.	A	4' aisle space from class II flammable.	×			-----	3–4	II

Table 5-5. Hazardous Materials Storage and Handling Criteria—Continued

(See notes at end of table for explanation of codes.) .

Noun	Hazard Identity				Storage and Handling	Stor-age Comp Group	Separation Requirement	Type of St ge Facilities				Portable Fire Extin-guisher Type	Class Liquid
	Health	Flare ma-ability	Reac-tivity	Spe cifi Haz ard				Flamn Stge Bldg	Acid Stge Bldg	C (S F	Gen Pur-pose Whse		
Acrylic Acid	3	2	2	O	Protect against physical damage.	B	4' aisle space --------	----	X	-	----	3	11
Acrylic Aldehyde (See Acrolein)													
Acrylenitrile	4	3	2	o	Store in end of building to aid fire fighting.	A	4' aisle space from class 11 flammables.	x	----	-	----	3-4	IB
Aerosols (Paint)	See label --..-.---				More in end of building.	D	3' aisle space	----	----	-	x	2,3,4	
Alcohol (Denatured) ..	—	4	0	0	More in end of building to aid fire fighting.	A	4' aisle space	x	----	-	----	3-4	IB
Aldehyde (See Acetaldehyde)													
Allyl Alcohol	3	3	1	0	Store in end of building.	A	4' aisle space from class II flammables.	x	----	-	-----	3-4	IB
See Organic Coating Materials.													
Allyl Aldehyde (See Aerolein)													
Allyl Chlorocarbonate (See Allyl Chloroformate)													
Allyl Chloroformate . .	3	3	1	c	Store in end of building.	A	4' aisle space from class 11 flammables.	x	-----	-		3-4	IC
Allylamine	3	3	1	o	Store in end of building.	A	4' aisle space from class I I flammables.	x	-----	-	-----	3-4	IB
Alum (See Aluminum Potassium Sulphate)													
Aluminum (Dust or Powder).	0	1	1	E	Separate from combustible items.	D	3' aisle space ---------	-----	-----	-	x	5	
Aluminum Acetate ----	1	0	0	o	No special handling ---	D	None ----------	-----	-----	-	x	1-3	
Aluminum Ammonium Sulphate.	1	0	0	0	No special handling ...	D	None ----------	-----	-----	-	x	1-3	
Aluminum Chloride ----	3	0	2	E	No special handling ...	D	None ----------	-----	-----	-	x	1-3	
Aluminum Potassium Sulphate.	1	0	0	o	No special handling ...	D	None . ----------	.....	-----	-	x	1-3	
Aluminum Sulphate ...	1	0	0	0	No special handling ---	D	None ----------	..---	-----	-	x	1-3	

Amino Cyclohexane (see Cyclohexylamine)														
Aminopropane (See Propylamine)														
Aminotoluene (See Toluidine) (Ortho, Pars)														
Ammonia (Anhydrous)	3	1	0	0	Separate from gases such as chlorine, bromide, etc.	c	Separate building or solid compartment.	-----	-----	x	-----			
Ammonium Acetate ...	0	0	0	0	No special handling --	D	gone ----------	-----	-----	-----	x	-3		
Ammonium Bifluoride .	2	0	0	0	No special handling --	D	None ----------	-----	-----	-----	x	-3		
Ammonium Chloride .	1	0	0	0	No special handling --	D	None ----------	-----	-----		x	-3		
Ammonium Citrate ----	0	0	0	0	No special handling --	D	None ----------	-----	-----	-----	x	-3		
Ammonium Dichromate	3	2	1	D	Separate from combustible items.	D	3' aisle space ----------	-----	----	-----	x	-3		
Ammonium Hydroxide	2	1.	1	o	Separate from combustible "items.	D	3' aisle space ----------	-----	----		x	-3		
Ammonium Nitrate ----	2	1	3	D	Separate from Organic materials, immediately remove and dispose of any spilled nitrate. 'Bulk quantities shoul be stored in accordance with TO 428-1-3."	D	3' aisle space ----------	-----	----	-----	x			
Ammonium PerChlorate	z	1	4	D	Separate from combustible items.	D	3' aisle space ----------	----	----	-----	x			
Amyl Acetate ----------	1	3	0	o	Store with class I flammables.	A	4' aisle space with class 1 I flammables.	x	----	-----	----	-4	IC	
Amyl Alcohol ----------	1	2	0	0	Store with class II flammables.	A	Separate from class I flammable by 4' space.	x	----	-----	----	,3,4	IC	
Amyl Hydrosulfide (See Amyl Mercaptan)														
Amyl Mercaptan ------	2	3	0	0	Store with class 11 flammables.	A	Separate from class I flammable by 4' space.	X	----	----	----	,4,5	IB	
Amyl Sulfhydrate (See Amyl Mercaptan)														
Aniline ----------	3	2	0	0	Store with class 11 flammables.	A	4' aisle space ----------	x	----	----	----	,4,5	IIIA	
Anthion (See Potassium Persulfate)														

Table 5-5. Hazardous Materials Storage and Handling Criteria—Continued

(See notes at **end** of table for explanation of codes.)

Noun	Hazard Identity				Storage and Handling	Storage Comp Group	Separation Requirement	Type Facilities				Portable Fire Extinguisher Type	Claw Liquid
	Health	Flammability	Reactivity	Specific Hazard				Flamm Stge Bldg		Com Gas Stge Bldg	Gen Purpose Whse		
Anti-Freeze (75% Ethylene Glycol).	—	1	1	0	None	D	8' aisle space	-----		---	x	3-4	IIIB
Antimonic Sulfide (See Antimony Pentasulfide)													
Antimony Pentasulfic	3	1	1	0	Separate from other items.	D	8' aisle space	-----		---	x	1	
Antimony Red (See Antimony Pentasulfide)													
Argon Gas	0	0	0	0	None	C	None	-----		x	-----	N/A	
Aqua Fortis (See Nitric Acid)													
Azotic Acid (See Nitric Acid)													
Barium Binoxide (See Barium Peroxide)													
Barium Chlorate	1	0	2	D	Separate from other items.	D	8' aisle space	-----		---	x	1	
Barium Dioxide (See Barium Peroxide)													
Barium Nitrate	1	0	1	D	Do not store on wood pallets. Immediately remove and dispose of any spilled nit rate.	D	8' aisle space	-----		---	x	1	
Barium Peroxide	1	0	1	D	Separate from combustible organic materials. Remove spilled peroxide immediately.	D	8' aisle space	-----		---	x	Dry powder.	
Barium Superoxide (See Barium Peroxide)													
Benzene	—	3	0	0	Store in end of building to aid fire fighting.	A	Separate from class II flammable liquids by 4' space.	X		---	-----	3,4,5	IB

Benzol (See Benzene)													
Benzoic Acid ----------	2	1	0	0	Separate from oxidizing materials.	D	3' aisle space	--	-----	-----	x	,3,4	
BENZOYL PEROXIDE.	1	4	4	D	Special facility handling.	E							
Beryllium (Dust or Powder).	4	1	1	E	Separate from oxidizing materials.	D	3' aisle space -.----.--	--	-----	-----	x		
Biethylene (See **Butadiene**)													
Bleaching Powder (See Calcium *Hypochlorite*)													
Boroethane (See Diborane)													
Bromine (Small Lots Only).	4	0	0	M	Separate from acids-Keep from freezing. (Freezing point is 20° F.)	B	Maintain 5' space from acids.	--	x	-----	----		
Bromochloromethane --	1	0	0	o	Protect from physical damage.	D	None ----------	--	-----	-----	x	N/A	
Bronze (Duet or Powder).	-----	0	1	E	Protect from physical damage.	D	Keep separate from aluminum dust.	--	-----	-----	x		
Burnt Lime (See Calcium Oxide).													
Butadiene Gas ---------	2	4	2	o	Do not store with oxygen cylinders.	c	Separate building or solid compartment.	--	.....	x	----	1-4	
Butanal (See Butyraldehyde).													
Butane **Lighter** Fuel (2 3-oz containers).	1	4	0	0	Store in end of building.	A	3' aisle space from class II flammables.	X	.....	-----	----	1-4	
Butanoic Acid (See **Butyric** Acid).													
Butanol (See **Butyl** Alcohol).													
Butyl Alcohol ----------	1	3	0	0	Store with class II flammables.	A	Separate from class I flammable liquid by 4' aisle space.	X	.....	-----	----		IC
Butyl Acetate ----------	1	3	0	0	Store in end of building.	A	Separate from class II	X	-----	-----	----	1-4	IB
Butyl "Cellosolve" -----	2	2	0	0	Store with class II flammables.	A	1' aisle space from class I flammables.	X	-----	-----	----	1-4	IIIA
Butyl Ether (See **Dibutyl** Ether).													
BETYL HYDROPEROXIDE.	1	4	4	D	Special storage and handling.	E	1' aisle space ---------	--	-----	-----	----	,3,4	II
BUTYL PERACETATE.	2	3	4	D	Special storage and handling.	E							

Table 5-5. Hazardous Materials Storage and Handling Criteria-Continual

(See notes at end of table for explanation of codes.)

Noun	Hazard Identity: Health	Flammability	Reactivity	Specific Hazard	Storage and Handling	Storage Comp Group	Separation Requirement	Type Storage Facilities: Flamm Stge Bldg	Acid Stge Bldg	Corr Stge Bldg	Gen Purpose Whse	Portable Fire Extinguisher Type	Class Liquid
BUTYL PERBENZOATE.	1	3	z -	D	Special storage and handling.	E							
BUTYL PEROXYPIVALATE	2	3	4	D	Special storage and handling.	E	----------	-----	----	--	-----	3,4	
Butyraldehyde (Normal and Iso).	2	3	1	0	Store in end of building,	A	1' aisle space ----------	x	----	--	-----	3,4 Foam	IB
Butyric Acid	2	2	0	0	Store in end of building.	B	1' aisle space ---------	-----	x	--	-----	3,4	111A
Butyric Aldehyde (See Butyraldehyde).													
Cadmium Oxide ------	3	0	0	0	'Jo special treatment	D	None ----------	-----	----	--	x	1-3	
CALCIUM ----------	1	4	2	E	Special storage and handling.	E	----------	-----	----	--	----	5	
Calcium Carbide ------	1	4	2	E	Store in unsprinklered, non-combustible shec for storage over 10 drums.	D E	End of warehouse with 3' space from other materials.						
Calcium Cyanide ------	4	0	0	0	No special treatment	D	Separate from oxidizing materials.	-----	----	--	x	3	
Calcium Hydroxide (Slacked Lime).	1	0	0	0	No special treatment	D	None ----------	-----	----	--	x	1-3	
Calcium Hypochlorite (Bleaching Powder).	2	4	2	E	Protect against physical damage. Keep dry, store in unsprinklered space.	D	Separate from combustible materials by 3' aisles.						
Calcium Oxide (Quick Lime).	1	0	1	0	Store in dry place ----	D	None ----------	-----	----	--	x	1-3	
Calcium Sulfate -------	1	0	0	0	No special treatment	D	None	-----	----	--	x	1-4	
Calibrating Fluid (F.P. 100° F.).	ee label --		-----	0	Store with class II flammables.	A	Separate from class I by 4' aisle.	x	----	--	-----	3-4	II
Calyx (See Calcium Oxide)													
Carbamic Nitrile (See Cyanamide)													
Carbolic Acid (See Phenol)													
Carbon Dioxide (Gas) .	1	"o	0	0	Extinguishing agent .	c	None ----------	-----	----	X	-----	N/A	
Carbon Dioxide (Solid)	1	0	0	0	No special treatment	D	None ----------	-----	----	--	x	N/A	11

Carbon Disulfide -------	2	3	—	0	Stored in end of building to aid fire fighting.	A	Separate from class 11 flammables by 4' aisle space.	x	-----	-----	---	1-4	II
Carbon Removing Compound.	See label			0	No special handling ..	D	None ----------	-----	-----	-----	x	1-4	
Carbon Tetrachloride ..	—	0	0	0	Protect from physical damage.	A	None	-----	-----	-----	x	N/A	
catalyst ----------	See label			0	Store with class II flammables.	A	Separate from class I flammables.	x	-----	-----	---	3/4	
Caustic Potash (See Potassium Hydroxide).													
Caustic Soda (See Sodium Hydroxide).													
Celluloid (See Cellulose Nitrate).													
Cellulose Acetate (Dopes) . ---------- ...	2	2	3	0	Protect against excess of heat or light.	A	Separate from class I flammables by 3' aisle space.	x	-----	-----	---	4	
Cellulose Nitrate (Dopes) ----------	2	3	3	0	Store in end of building to aid fire fighting.	A	Separate from class II flammables by 3' aisle space.	X	-----	-----	---	1,3	
Cement, Rubber . ------	See label ..		-----	0	Store in end of building to aid in fire fighting.	A	' aisle space from class 11 flammables.	-----	-----	-----	x	1-4	
Charcoal	0	2	0	0	Store away from oxidizing materials (subject to spontaneous heating).								
Charcoal (Activated) ..	0	2	0	0	i tore away from oxidizing materials (subject to spontaneous heating).	D	' aisle space ---------	-----	-----	-----	x	1	
chloride of Lime (See Calcium Hypochlorate).													
Chlorinated Lime (See Calcium Hypochlorate).													
Chlorine ----------	3	0	1	D	Keep in separate building or separated from acetylene, ammonia hydrogen gases.	c	Solid wall compartments or separate building.	-----	-----	x	---	1	
Chlorobenzene (See Monochlorobenzene).													
Chlorobenzole (See Monochlorobenzene).													

Table 5-5. Hazardous Materials Storage and Hand] ing Criteria—Continued

(See notes at end of table for explanation of codes.)

	Hazard Identit:						Separation Requirement	T;	or Stc	ge Facilities		Portable Fire Extin- guisher Type	Class Liquid
	Health	Flam- ma- bility	Reac- tivity	spe- cific Haz- ard	Storage and Handling	Stor- age Comp Grou		Flamm Stge Bldg	Acid Stge Bldg	Con Ga: Stg Bld	Gen Pur- pose Whse		
Chloroethane (See Ethyl Chloride).													
Chloroethene (See Viny Chloride).													
Chloroethylene (See Vinyl Chloride),													
Chloroform ----------	—	0	0	0	No special treatment	D	None ----------	-----	----	---	x	N/A	
Chlorosulfonic Acid . . .	3	0	2	N	Drums must be stored with plugs up. Drums must be vented once a week.	B	3' aisle space .-.-----	-----	x	---	-----	N/A	
Chromic Acid (See Chromium Trioxide).													
Chromic Anhydnde (See Chromium Trioxide).													
Chromium Trioxide . . .	1	0	1	D	Do not store on wood floors or pallets.	B	3' aisle space ---------	-----	x	---	-----	1	
Cinnamene (See Styrene).													
Cleaning Compound Solvent (F.P. 190" F.).	ee label ----------				Separate from class I flammables.	A	1' aisle space from class I flammables.	X		---	-----	5	IIIB
Cleaner and lubricant (See Methyl Chloroform).													
Cobaltus Nitrate ------	1	0	1	D	Do not store on wood floors or pallets.	D	Separate from combustible materials by 3' aisle space.	-----	-----	---	X	I	
Collodion (See Cellulose Nitrate).													
Copper Carbonate -----	1	0	0	o	No special handling ..	D	None ----------	-----	-----	---	x	3	
Copper Sulfide -------	1	0	0	E	No special handling --	D	None --.--_-----...---	-----	-----	---	x	1–3	
Copper Sulphate.													
Copper Nitrate -------	1	0	1	D	Do not store on wood floora or pallets.	D	Separate from combustible materials by 3' aisle space.	-..--	-----	---	x	1	

Corrosion Preventive (F.P. 350° F.).	See label			0	No special handling	A/D	1' aisle space	x	---	-----	x	1-4	IIIB
Corrosion Remover	See h	el			No special handling	D	None	-----	---	-----	x	1-4	
Cresol, Ortho	3	2	0	C	No special handling	A	May be stored with class II flammables.	X	---	-----	-----	1-4,5	II
Meta	3	1	0	c									
Cresylic Acid (See Cresol).													
Cresylic Alcohol (See Cresol).													
CUMENE HYDROPEROXIDE.	1	2	4	D	Special facility requirement. Non-combustible, detached, ventilated, unheated building. Water deluge system required for large quantity storage.	E	Do not store with other material.	-----	---	-----	-----	1,4,5	IIA
Cupric Carbonate (See Copper Carbonate).													
Cupric Fluoroborate	1	0	0	0	No special handling	D	None	-----	---	-----	x	1-3	
Cupric Nitrate (See Copper Nitrate).													
Cupric Sulphate.													
Cyanamide	4	1	3	0	No special handling	D	1' aisle space	-----	---	-----	x	1-3	IIIB
Cyanogen (Gas)	4	4	2	E	Do not store with oxygen cylinders.	c	Separate building or solid wall compartment.		---	x	-----		
Cyclohexane	1	3	0	0									
Cyclohexanone	1	2	0	0									
Cyclohexylamine	2	3	0	0	No special handling	A	May be stored with class I I flammables.	x	---	-----	-----	1, 2a, 3, 4	IC
Desk (See Diethyl Aluminum Chloride).													
Decaborane	3	2	1	0	Separate from oxidizing agents.	D	1' aisle space	-----	---	-----	x	1-4	
Decaboron Tetradecahydride (See Decaborane).													
Decontaminating Agent	See label			0	No special handling	D	None	-----	---	-----	x	1-4	
Deodorants (Dichlorobenzene Ingredients).	2	2	0	0	No special handling	D	None	-----	---	-----	x	1-4	
DeOxidant	-----	----	----	....	No special handling	D	None		---	-----	x	1-4	
Desiccants (Activated)	-----	----	----	----	No special handling	D	None	-----	---	-----	x	1-4	
Developer Inspection Penetrants (Fluorescent and Non-Fluorescent).	See label				Store with class I1 flammables.	A	Separate from class I flammables by 3' aisle space.	x	---	-----	-----	1-4	
Diacetyl Peroxide (See Acetyl Peroxide).													

Table 5-5. Hazardous Materials Storage and Handling Criteria—Continued

(See notes at end of table for explanation of codes.)

Noun	Hazard Identity				Storage and Handling	Storage Group	Separation Requirement	Type of Storage Facilities				Portable Fire Extinguisher Type	Class Liquid
	Health	Flammability	tivity	cific Haz'd				Flamm Stge Bldg	Acid Stge Bldg	Comp Gas Stge Bldg	Gen Purpose Whse		
Diamine (See Hydratine).													
Diborane (Gas) ---------	3	4	3	E	Separate from oxygen cylinders. (Gas will ignite spontaneously on contact with air.).	C	Separate building or solid compartment.	-----	----	x	-----	1-4	IA
Diboron Hexahydride (See Diborane).													
Dibutyl Ether ---------	2	3	0	o	Store in end of building to aid fire fighting.	A	1' space from class II flammable liquids.	x	----	-----		3,4,5	IC
Dibutylperoxide (Tertiary).	2	3	4	D	Store in end of building to aid fire fighting.	A	1' space from class II flammable liquids.	x	----	-----	-----	3,4,5	IB
Dichlorobenzene (Ortho)	2	2	0	o	Store with class II flammables.	A	I' aisle space from class I.	x	----	-----	-----	.,3,4,5	IIIA
Dichlorobutane --------	2	2	0	0	May be stored with class II flammable liquids.	A	Separate from class I flammables, 4' aisle space.	x	----	-----	-----	3,4,5	II
Dichlorodifuoromethane (Freon—12 Gas).	1	0	0	0	No special handling ...	c	nert gas-may be stored with any other type gas.	-----	----	x	-----		
Dichloro Ethane (See Ethylene Dichloride).													
Dichlorothylene (See Vinylidene Chloride).													
Diethyl Aluminum Chloride,	3	3	3	E	Protect containers against shock and damage.	A	May be stored with class 11 flammables.	x	----	-----		1-4	
Diethylamine ---------	2	3	0	o	.....	-----	------ ------ --------- ..	-----	----	-----	-----	2a,3,4	
Diethylene Dioxide (See Dioxane).													
Diethylene Ether (See Dioxane).													
Diethyl Ether (See Ether).													
Diethyl Oxide (See Ether).													

Diethylenetriamine	3	1	0	0	Protect against physical damage.	A	May be stored with class II flammables.	x	-----	-----	-----	2a-3-4	IIIB
Diethylene Glycol (F.P. 276* F.).	-----	2	0	0	No special handling if in general purpose warehouse.	A,D	4' aisle space if stored in flammable building.	x	-----	-----	x	3-4	IIIB
Diethyl zinc ----------	—	3	3	E	Protect against physical damage.	A	3' aisle space ..-------	x	-----	-----	-----	3-4	
Diisopropylamine	3	3	0	o	Protect against physical damage.	A	4' aisle space	x	-----	-----		2a-3-4	IB
DIISOPROPYL PEROXYDICAR - BONATE.	—	4	4	D	Special handling and facility. Max. 53° F.	E							
Dimethylamine (See Methyl Amines).	3	4	0	o									
Dimethyl Benzene (See Xylene).													
Dimethylene Oxide (See Ethylene Oxide).													
Dimethyl Sulfide	4	4	0	0	Store in end of building to aid fire fighting.	A	Separate from class I flammables by 3' aisle space.	x	-----	-----		3-4	
DINITROBENZENE (ORTHO).	3	1	4	0	Special handling and facility.	E	4' aisle space	----	-----	-----		1,3,4	IIIB
DINITROTOLUENE -	3	1	3	0	Special treatment and facility. Explosive hazard when involved in fire.	E		-... .	-----	-----	-----	1,3,4	
Dioxane Pars ----------	2	3	0	0	Store in end of building to aid in fir fighting.	A	Separate from class 11 flammables by 4' aisle space.	x	-----	-----	-----	3-4	IB
Diphacinpariffin (See Rodenticide).													
Dopes (See Cellulose Nitrates and Cellulose Acetates).													
Drying Agent (Aerosol)	0	1	0	0	No special treatment	D	None ----------	----	-----	-----	x	3-4	
Dust Mop Treatment Compound.	See label ----------				No special treatment	D	None ----------	----	-----	-----	x	3-4	
Dye Solutions (1 Qt. Bottles).	See label ..... ----------				Store in end of building to aid in fir fighting.	A	Separate from class II flammables by 3' aisle space.	x	-----		-----	3-4	
Dye, Xylene. Azo, Xylene.	0	3	0	0	Store in end of building to aid in fir fighting.	A	Separate from class II flammables by 3' aisle space.	x	-----	-----	-----	3-4	
Enamels (See Organic Coating Materials).													
Ether (Ethyl—Diethyl)	2	4	1	0	Store in end of building to aid in fir fighting.	A	Separate from class II flammables by 4' aisle space.	x	-----	-----	-----	3-4	IA

Table 5-5. Hazardous Materials Storage and Handling Criteria—Continued

(See notes at end of table for explanation of codes.) , "".

	Hazard Identity				Storage and Handling	Storage Comp Group	Separation Requirement	Type of Storage Facilities				Portable Fire Extinguisher Type	Clam Liquid
	Health	Flare mability	Reactivity	Specific Hazard				Flamm Stge Bldg	Acid Stge Bldg	COmp Gas Stge Bldg	Gen Purpose Whse		
Etherin (See Ethylene).													
Ethyl Acetate	1	3	3	0	Store with class I flammables,	A	Separate from class 11 flammables by 4' aisle space.	x	----	-----	----	-4	IB
Ethylacetic Acid (See Butyric Acid).													
Ethyl Acrylate ---------	2	3	2	0	Store with class I flammables.	A	Separate from class 11 flammables by 4' aisle space.	x	----	-----	----	,3,4	IB
Ethyl Alcohol ----------	—	4	0	0	Store with class I amma	A	Separate from class II flammables by 4' aisle space.	x	----	-----	----	~~-3-4~~	IB
Ethylamine	3	4	0	0									
Ethyl Benzene	2	3	0	0	Store with class I flammables.	A	Separate from class II flammables by 4' aisle space.	x	----	-----	----	-1	IB
Ethyl Benzol (See Ethyl Benzene).													
Ethyl Chloride	2	4	0	0	Store with class I flammables.	A	Separate from class II flammables by 4' aisle space.	x	----	-----	----	-4	1A
Ethyl Nitrate (Nitric Ether).	2	3	4	0									
Ethyl Ether (See Ether).													
Ethyl Nitrite (Nitrous Ether).	2	4	4	0	Store with class I flammables at end of building.	A	4' aisle space from class II.	x	----	-----	----	,3,4	1A
Ethyl Oxide (See Ether),													
Ethylene	1	4	2	0	Separate from oxygen, chlorine gases.	c	Separate building or solid compartment.	-----	----	x	x	-4	
Ethylene Aldehyde (See Acrolein).													
Ethylene Chloride (See Ethylene Dichloride).													
Ethylene Dichloride ...	2	3	0	0	Store with class I flammables.	A	Separate from class II flammables.	x	----	-----	----	-4	IB
Ethylene Glycol Monobutyl (See "Butyl Cellosolve").													

Ethylene Oxide (Gas) . .	2	4	3	0	Store in separate shed or in gas building separate from oxygen.	c	Solid compartment away from oxygen.	-----	-----		-----	-4	
Feric Chloride	2	0	0	H	No special handling ..	D	----------	-----	-----		x	-4-5	
Ferric Nitrate	0	1	0	D	No special handling ..	D	----------	-----	-----		x	-4	
Ferrous Sulphate	0	0	0	o	No special handling --	D	----------	-----	-----		x	-4	
Fluorine ----------	4	0	3	J	Separate storage or separate from oxygen.	c	Separate building or solid compartment.	-----	-----		-----	Water spray	
Formaldehyde Solution	2	2	0	o	Separate from combustible and oxidizing materials.								
Gas ----------	2	4	0	0		D c	4' aisle space --------	-----	-----		x	-4	111A
Formalin (See Formaldehyde).													
Formic Acid ----------	3	2	0	c	Separate from other acids.	B	?' aisle space --------	-----	x		----	-3	111A
Formic Aldehyde (See Formaldehyde).													
Freon (See Dichloro-difluromethane).													
Glycerol (See Glycerin).													
Glycerin ----------	—	1	0	o	No special treatment	D	4' aisle space .. -. -.. .	-----	-----		x	-3	IIIB
Greases ----------	o	1	0	0	No special treatment	D	None ----------	-----	-----		x	-3-4	
Gum Preventive (Gasoline).	—	3	0	0	Store in end of building.	A	3' aisle from class II flammables.	x	-----		....	-4	
Guncotton (See Cellulose).													
Helium ----------	o	0	0	0	Inert gas	c	None ----------	-----	-----		----	N/A	
Helium and Methane ..	0	1	0	0	No special handling . .	c	None ----------	-----	-----		----	N/A	
Helium and Nitrogen ..	0	0	0	0	Noncombustible gas	c	None ----------	-----	-----		----	N/A	
Herbicides ----------	See label --		-------	----	No special treatment	D	None ----------	-----	-----		x	-3	
Hexametaphosphate ..	0	0	0	O	No special treatment	D	None ----------	-----	----		x	-3-4	
Hexamethylene (See Cyclohexane).													
Hexone (See Methyl Isobutyl Ketone).													
Hydraulic Fluid	See label --		-----	----	No special handling ..	D	None ----------	----	----		x	-3-4	
Hydrazine (Anhydrous)	3	3	2	C	Store in end of building to aid in fir fighting.	A	Separate from class 11 flammables by 4' aisle space.	x			----	-3-4	11
Hydrochloric Acid ----	3	0	0	c	Protect against physical damage.	B	3' aisle space -------	----	x		....	-3-4	
Hydrocyanic Acid (See Hydrogen Cyanide).													

Table 5–5. Hazardous Materials Storage and Handling Criteria—Continued

(See notes at end of table for explanation of codes.)

	Hazard Identity				Storage and Handling	Storage Comp Group	Separation Requirement	Type Facilities			Portable Fire Extinguisher Type	Class Liquid
	Health	Flammability	Reactivity	specific Hazard				Flamm Stge Bldg		Com Gas Stge Bldg	Gen Purpose Whse	
Hydrofluoric Acid	4	0	0	c	Protect against physical damage.	B	3' aisle space ----------	-----		---	-----	1	
Hydrogen (Gas) . -------	0	4	0	0	Storage in separate building or gas storage shed.	c	Solid partition from oxygen cylinders.	-----		x	-----	3-I	
Hydrogen Chloride (See Hydrochloric Acid).													
Hydrogen Cyanide ----	4	4	2	0	Store in end of building to aid fire fighting.	A	4' aisle space from class 11 flammables,	X		...	-----	3-4	IA
Hydrogen Dioxide (See Hydrogen Peroxide).													
Hydrogen Fluoride (See Hydrofluoric Acid).													
Hydrogen Peroxide ----	2	0	1	M	Do not store on wood pallets or dunnage.	B	10' space from other acids.	-----		---	-----	1	
over 52% . . . . . .-	2	0	3	M									
Hydrogen Sulfate (See Sulphuric Acid).													
Hydrogen Sulfide ------	3	4	2	0	Separate building or ir compressed gas shed, separate from oxygen.	c	Solid partition from oxygen cylinders.	-----		x	-----	1–2–4 Spray	
Hydroxybenzene (See Phenol).													
Hydroxylamine --------	1	3	3	0	Separate from class I flammables.	A	4' aisle from class I flammables.	X		---	-----	3	IIIB
Inhibitors (See Trisodium Phosphate).	0	2	0	0	No special handling ..	D	None ---.---.---------	-----		---	x	1-3	
Insecticide (Chlordane)	3	2	0	0	No special handling ..	D	None ----------	-----		---	x	1-3	
Insecticide (DDT) ------	3	0	0	0	No special handling ..	D	None ----------	-----		---	x	1-3	
Insecticide (DDT-Aerosol).	3	1	1	0	No special handling --	D	None ----------	-----		---	x	1–3	
Insecticide (Diazinon) --	3	0	0	0	No special handling --	D“	None ----------	-----		---	“ x	1-3	
Insecticide (Dialdrin) ..	3	0	0	0	No special handling --	D	None ----------	-----		---	x	1-3	
Insecticide (Lindane) ..	3	0.	0	0	No special handling --	D	None ----------	.....		---	x	1-3	
Insecticide (Malathion)	2	0	0	0	No special handling ..	D	None ----------	-----		---	x	1-3	
Insecticide (Pyrethrin)	2	1	0	0	No special handling --	D	None ----------	-----		---	x	1-3	

Insect Repellent -------	2	1	1	1	0	1	0	No special handling	D	None ----------	---	-----	-----	x	1-3	
Inspection Penetrant Emulsifiers & Removers.	See label ----------							Store with class I I flammables,	A	3' aisle space from class I flammables.	x	-----	-----	-----	3-4	
Insulating Varnish -----	See label -----.----_---.-							More in end of building to aid in f fighting.	A	Separate from class I I flammables by 4' aisle space.	x	-----	-----		3-4	IC
Isopropyl Formats ----	2		3		0		0	More in end of building to aid in f fighting.	A	3' aisle space from class II flammables.	x	-----	-----	-----	3-4	
Isopropyl Methanoate (See Isopropyl Formate).																
Iodic Acid (Crystals) --	0		z		1		D	Separate from other acids.	B	3' aisle space ----------	---	x	-----	-----	3-4	
Iodine ----------	2		0		0		D	No special handling	D	None ----------	---	-----	-----	x	1,3,4	
Isoamyl Acetate (See Amyl Acetate).																
Isobutyl Methyl Ketone	2		3		2		0	Store in end of building.	A	I' aisle space from class I I flammables.	x	-----	-----	-----	3-4	IC
Isopropyl Alcohol .-.---	1		3		0		0	Store in end of building.	A	I' aisle space from class I I flammables.	x	-----	-----	-----	3 4	IB
Kerosene (130° F. P.) --	0		2		0		0	Store with class 11 flammables.	A	I' aisle space from class I flammables.	x	-----	-----	-----	3-4	II
Lacquers ----------	See label -----.--.--- -----							Store in end of building.	A	Separate from class II flammables.	x	-----	-----	-----	3-4	IC
Lanthanum Nitrate ----	0		o		3		D	No special handling	D	3' aisle space ----------	---	-----	-----	x	1-3-4	
LAUROYL PEROXIDE.	—		2		3		D	Special facility required for quant storage.	E							
Lead Nitrate ----------	—		1		2		0	Store in end of building.	D	Separate from class, I I flammables.	---	-----	-----	x	1-3-4	
Lead Sulfocyanate -----	1		1		1		0	Separate from other items.	D	3' aisle space ----------	---	-----	-----	x	1	
Lead Thiocyanate (See Lead Sulfocyanate).																
Lime (Unslaked) (See Calcium Oxide).																
LITHIUM ..--.--------	1		1		2		E	Special handling and storage required.	E		---	----	-----	-----	5	
Lithium Aluminum Hydride.	3		1		2		E	No special handling	D		---	-----	-----	x	5	
LITHIUM HYDRIDE	1		,4		2		E	Special handling and facility required.	E	----------	---	-----	-----	-----	5	
Lye (See Potassium Hydroxide).																
MAGNESIUM (Including Alloys).	—		1		2		E	Special handling and storage.	E	----------	---	-----	-----	-----	5 Talc	
Magnesium Chloride ---	—		1		0		0	No special handling	D		---	-----	-----	x	1-3-4	

Table 5-5. Hazardous Materials Storage and Handling Criteria

(See notes at end of table for explanation of codes.)

	Hazard Identity				Storage and Handling	Storage Comp Group	Separation Requirement	Type of Storage Facilities				Portable Fire Extinguisher Type	class Liquid
	Health	Flammability	Reactivity	Specific Hazard				Stge Bldg	Acid Stge Bldg	Comp Gas Stge Bldg	Gen Purpose Whse		
Magnesium Nitrate	1	0	1	D	Protect from physical damage.	D	Separate from combustible items by 3' aisle space.	-----	-----	-----	X	3-4	
Magnesium Perchlorate	1	0	1	D	Protect from physical damage.	D	Separate from combustible items by 3' aisle space.	-----	----	-----	x	3-4	
Maleic Anhydnde (Crystals).	3	1	1	E	Store with class 11 flammables.	A	3' aisle space ---------	x	----	-----		3-4	
Mandelic Acid (crystals).	1	0	0	o	No special handling . . .	D	None ----------	-----	-----	-----	x	1-3-4	
Mannitol (Crystals)	1	1	0	0	Protect from physical damage.	D	Separate from combustible items by 3' aisle space.	-----	-----	-----	x	3-4	
Mercury	3	0	0	0	No special handling ---	D	----------	-----	-----	-----	x	3-4	
Mesityl Oxide	3	3	0	0	Store in end of building to aid in tire fighting.	A	Separate from class II flammables by 4' aisle.	-----	x	-----		3-4	IC
Methacrylic Acid	3	2	2	0	Protect against physical damage.	B	3' aisle space	-----	x	-----	-----	3-4	IIIA
Methanel (See Formaldehyde).													
Methanol (See Methyl Alcohol).													
Methane Gas ----------	1	4	0	0	Separate from oxygen cylinders.	c	Solid compartment or separate building.	-----	-----	x	-----	4	
Methyl Acrylate -------	2	4	2	0	Store in end of building.	A	Separate from class II flammables by 4' aisle.	x	-----	-----	-----	3	IB
Methyl Alcohol --------	—	3	0	0	Store in end of building.	A	Separate from class 11 flammables by 4' aisle.	x	-----	-----		3-4	IB
Methylamines (Mono, di).	3	4	0	0	Store in end of building.	A	Separate from class II flammables by 4' aisle.	x	-----	-----	-----	3-4	IA
(Tri).	2	4	0	0									
Methyl Benzene (See Toluene).													
Methyl Bromide -------	3	0	2	0	Non Flammable Gas ..	c	None ----------	-----	-----	x	-----	N/A	
Methyl Chloride Chloromethane.	—	4	0	0	Flammable Gas -------	-----	Separate from Oxygen	-----	----	x		Stop-flow of gas.	

Methylene Chloride ----	2	0	0	0	Non Flammable Gas ..	c	None ----------	-----	-----	X	-----	N/A		
Methyl Chloroform ----	2	0	0	0	No special handling ---	D	None ----------	-----	-----	-----	x	3–4		
Methyl Cyanide (See **Acetonitrile**).														
Methyl Ethyl Ether ---	2	4	—	0	Store in end of building to aid in fire fighting.	A	Separate from class II flammables by 4' aisle.	x	-----	-----	-----	3–4	I A	
Methyl Ethyl Ketone ..	2	3	o	0	Store in end of building.	A	Separate from class II flammables by 4' aisle space.	x	-----	-----	-----	3–4	IB	
METHYL ETHYL KETONE PEROXIDE.	2	2	4	D	Special handling and storage.	E								
Methyl **Formate** -------	2	4	—	o	Store in end of building to aid fire fighting.	A	Separate from class 11 flammables by 4' aisle space.	x	-----	----		3–4	IA	
Methyl **Isobutyl** Ketone	2	3	—	0	Store in end of building to aid fire fighting.	A	Separate from class II flammables by 4' aisle space.	x	-----	----	-----	3–4	IC	
Methyl **Methacrylate** . .	2	3	2	0	Store in end of building to aid fire tire fighting.	A	Separate from class II flammables by 4' aisle space.	x	-----	----	-----	3–4	IB	
Methyl Phenol (See **Cresol**).														
Methylene Oxide (See 'Formaldehyde).														
Mineral **Spirits** (See Naphtha Aromatic).														
Molybdenum Disulfide (See Molybdenum Sulfide).														
Molybdenum Sulfide . .	1	0	0	0	No special handling --	D	None ----------	----	----	----	x	3–4		
Monochlorobenzene (Chlorobenzene).	2	3	—	0	Store in end of building to aid fire fighting.	A	Separate from class II flammables by 4' aisles.	x	----	----	----	3–4	IC	
Monochlorodifluoro-methane.	2	0	o	0	Separate from oxygen cylinders.	c	Separate building or solid compartment.		----	x	----	3–4		
Monoethanolamine (Ethanolamine).	2	4	0	0	Wore in end of building to aid fire fighting.	A	Separate from class I I flammables by 4' aisle.	x	----	----	----	3–4	IIIB	
Muriatic Acid (See Hydrochloric Acid).														
Naphtha ----------	See label . .		....	0	Store in end of building to aid fire fighting.	A	Separate from class I I flammables.	x	----	----	----	3–4		
Naphtha **Aliphatic** ----	2	3	0	0	Store in end of building to aid in fire fighting.	A	Separate from class I I flammables.	x	----	----	----	3–4		

Table 5-5. Hazardous Materials Storage and Handling Criteria-Continued

(See notes at end of table for explanation of codes.)

Noun	Hazard identity				Storage and Handling	Storage Comp Group	separation Requirement	Type of Storage Facilities				Portable Fire Extinguisher Type	Class Liquid
	Health	mability	Reactivity	specific Hazard				Flamm Stge Bldg	Acid Stge Bldg	Comp Gas Stge Bldg	Gen Purpose Whs		
Naphtha Aromatic . ----	2	3	0	O	Separate from class II flammable.	A	3' aisle space ---------	X	-----	-----	---	3-4	
Naphthalene	2	2	—	0	Separate from class I flammables.	A	4' aisle space ---------	X	-----	-----	---	3-4	111A
Neatsfoot Oil	0	1	0	0	No special handling ---	D	4' aisle space	-----	-----	-----	X	3-4	IIIB
Nickle Acetate .....-	1	0	0	0	No special handling ---	D	None -----------		-----	-----	X	3-4	
Nickel Chloride . . ------	1	0	0	0	No special handling ...	D	None ----------	-----	-----	-----	X	3-4	
Nickel Nitrate	1	0	1	D	Separate from other items.	D	3' aisle space ---------	-----	-----	-----	X	3-4	
Nickel Sulfate	1	0	0	K	No special handling ---	D	None ----------	-----	-----	-----	X	3-4	
Nitric Acid .....-	2	0	2	K	Store with bungs up. Do not store on wood pallets or dunnage.	B	3' aisle space ---------	-----	X	-----	---	1	
Nitric Ether (See Ethyl Nitrate).													
Nitroaniline ----------	3	1	1	0	Separate from other items.	D	4' aisle space -.-------	-----	-----	-----	X	1-3	IIIB
Nitrobarite (See Barium Nitrate).													
Nitric Oxide (See Nitrogen Tetroxide).													
Nitrous Ether (See Ethyl Nitrite).													
Nitrobenzene	3	2	—	0	Store with class 11 flammables.	A	4' aisle space from class I flammables.	x	-----	-----	-..	1-3-4	111A
Nitrobenzol (See Nitrobenzene).													
Nitrocellulose (See Cellulose Nitrate).													
Nitrochlorobenzene ----	3	1	1	0	Store with class 11 flammables.	A	4' aisle space from class I flammables.	x	-----	-----	---	1-3-4	IIIB
Nitroethane .--.---.----	1	3	3	0	Store with class I flammables.	A	4' aisle space from class II and other class I flammables.	x	-----	-----	---	3-4	IC
Nitrogen (Gas) ---------	0	0	0	0	Nonflammable gas	c	None ----------	-----	-----	X	---	N/A	
Nitrogen Peroxide (Gas) (See Nitrogen Tetroxide).													

Nitrogen	3	0	1	D	Store away from oxygen cylinders.	C	Separate shed or solid compartment.		-----	X	-----	3–4		
Nitromethane	1	3	4	O	Store in end of building	A	4' aisle from class II flammables.	×	-----	-----	-----	3–4		IC
Nitropropanes	—	2	3	O	Store in end of building	A	4' aisle from class II flammables.	×	-----	-----	-----	3–4		II
Nitrous Ether (See Ethyl Nitrite).	2	4	4	O										
Nitrous Oxide	2	0	1	O	Do not store with flammable gases.	C	Separate building or solid compartment.			X		N/A		
Nitric Ether (See Ethyl Nitrate).														
Organic Coating Materials (Oil Base Paints, Enamels & Aerosols).	See label				Store in ends of bays or in areas offering quick access to fire department hose streams.	D	3' aisle space			--	×	2,3,4		
Oil of Vitriol (See Sulphuric Acid).														
Oils (Lubricating)	0	1	0	O	Store away from other items.	D	3' aisle space	-----	-----	-----	X	3–4		
Oxalic Acid	—	0	0	O	No special handling	B	3' aisle space from other acids.	-----	X	-----	-----	3–4		
Oxygen Gas	0	0	1	O	Do not store with flammable gases.	C	Separate building or solid compartments.	-----	-----	X	-----	N/A		
Paints (Oil Base) (See Organic Coating Materials).														
Paints (Water Base)	See label				No special handling	D	None	---	-----	--	X	1–3–4		
Paraldehyde	2	3	1	O	Store with class I flammables.	A	Separate from class II flammables.	X	-----	-----	-----	3–4		IC
Parathion	4	1	0	O	Separate from other items.	B	3' aisle space	---	×	-----	-----	1		
Penetrating Fluid (See Inspection Penetrant).														
Peracetic Acid	3	2	4	O	Separate from other items.	B	4' aisle space	-----	×	-----	-----	1		••
Perchloric Acid	3	0	3	K	Separate from other items. Protect against freezing—4° F. Do not store on wood pallets.	B	3' aisle space	-----	×	-----	-----	3–4		
Petroleum Ether (See Ether, also Benzine).	—	4	—	O										
Phenol (Carbolic Acid)	3	2	0	C	Separate from other items.	B	4' aisle space	--	X	-----		3–4		•IA
Phenolphthalein	1	0	0	O	No special handling	D	None	-----	-----	-----	X	3–4		
Phosphorus (Red)	-----	1	1	O	Separate from other items.	D	3' aisle space	-----	-----	-----	X	1		

T b 5–5. Hazardous Materials Storage and Handling Criteria—Continued

(See notes at end of table for explanation of codes.)

	Hazard Identity				Storage and Handling	Storage Comp Group	Separation	Type of Storage Facilities				Portable Fire Extinguisher Type	Class Liquid
	Health	Flammability	Reactivity	Specific Hazard				Flamm Stge Bldg	Acid Stge Bldg	Comp Gas Stge Bldg	Gen Purpose Whse		
Phosphorus (White-Yellow).	3	3	1	O	Separate from other items.	A	3' aisle space	X				1	
Phosphorus Penta-Sulfide.	3	1	2	E	Separate from other items.	D	3' aisle space				X	3 Dry Sand	
Phosphorus Sesquisulfide.	2	1	1	O	Separate from class I flammables.	A	3' aisle space	X				1	
PHOSPHORUS TRICHLORIDE.	3	0	2	H	Special facility	E							
PICRIC ACID	2	W	4	D	Special facility	E	4' aisle space						IIIB
Pine Oil	1	N	0	O	Store with class II flammables.	A	4' space from class I flammables.	X				3–4	IIIA
POTASSIUM	3	1	2	E	Special facility and handling.	E							
Potassium Bifluoride	1	0	0	O	No special handling	D	None				X	3–4	
Potassium Bromate	1	0	0	D	No special handling	D	None				X	3–4	
Potassium Carbonate	1	0	0	O	No special handling	D	None				X	3–4	
Potassium Chlorate	0	0	2	D	Separate from other items.	D	3' aisle space				X	1	
Potassium Chromate	1	0	0	D	No special handling	D	None				X	3–4	
Potassium Cyanide	0	0	0	O	Separate from other items.	S	3' aisle space				X	3	
Potassium Dichromate	2	0	0	D	Separate from other items.	D	3' aisle space				X	3–4	
Potassium Fluoride	1	0	0	O	No special handling	D	None				X	3–4	
Potassium Hydroxide (Lye).	3	0	1	B	Separate from other items.	D	3' aisle space				X	1	
Potassium Iodide	1	0	0	O	No special handling	D	None				X	3–4	
Potassium Nitrate	1	0	2	D	Separate from other items.	D	3' aisle space				X	1	
Potassium Perchlorate	1	0	2	D	Separate from other items.	D	3' aisle space				X	3–4	
Potassium Permanganate	0	0	1	D	Separate from other items.	D	3' aisle space				X	3–4	
Potassium Peroxide	3	0	2	D	Separate from other items.	D	3' aisle space				X	4	
Potassium Persulfate	1	0	0	D	Separate from other items.	D	3' aisle space				X	1	
Potassium Sodium Tartarate.	1	0	0	O	No special handling	D	None				X	3–4	

Potassium Sulfide	2	1	0	0	Separate from other items.	D	3' aisle space	----	-----	----	x		
Propionaldehyde (Propanal).	2	4	1	0	Store in end of building.	A	1' aisle space from group II flammables.	x	-----	----		I-4	IB
Propionic Acid ---------	2	2	0	0	Separate from class I flammables.	A	1' aisle space from class I flammables.	x	-----	----	-----	1-3-4	11
Propane Gas ----------	1	4	0	0	Stored separated from oxygen.	c	Separate building or solid compartment.	----	-----	x	-----	3-4	
Propane Torch Fuel (14 oz. containers) (See Soldering Torch Kit).													
Prophlamine	3	3	0	0	Store in end of building.	A	3' aisle space from class I I flammables.	X	----	----	-----	3-4	
Propyl Nitrate -------	2	3	3	0	Store in end of building.	A	1' aisle space ---------	X	----	----	-----	3-4	IB
Propylene (Gas) ..-- . . .	1	4	1	0	Separate from oxygen cylinders.	c	Separate building or solid compartment.	----	----	x	-----	3-4	
Prophlene Oxide -------	2	4	2	0	Store in end of building.	A	1' aisle space	X	----	----	-----	3-I	1A
Pyridine	2	3	0	0	Store in end of building.	A	1' aisle space .---.---	x		----	-----	3-I	IB
Pyrogallol ----------	1	0	0	0	No special handling ---	D	None ----------	----	----	----	x	3-4	
Pyroxylin (See Cellulose Nitrate).													
Que Bracho ----------	0	1	0	0	No special handling ---	D	None	----	----	----	x	1-3-4	
Quick Lime (See Calcium Oxide).													
Quick Silver (See Mercury).													
Rodenticide (Diphacinparaffin).	See label			0	No special handling ...	D	None ----------	----	----	----	x	1-3	
Rosin . ----------	See la	el		0	No special handling ---	D	None ---.------..--.--	----	----	----	x	3-4	
Saltpeter (See Potassium or Sodium Nitrate).													
Shellac (Liquid) -------	o	4	0	0	------- ----------	A	None ----------	----	----	----	x	2,3,4	
Silicone Compound . . .	See la	el . .	.....	----	No special handling ...	D	None	----	----	----	x	3-4	
Silver Cyanide . -------	1	0	0	0	No special handling . .	D	None ----------	----	----	----	x	3-4	
Silver Nitrate ---------	1	0	1	D	Separate from other items.	D	3' aisle space --------	----	----	----	x	3-4	
Skin Protective Compound.	0	0	0	0	No special handling ---	D	None ----------	---	----	----	x	3-4	
SODIUM ----.-.....--	3	1	2	E	Special handling and facility.	E							
Soldering Torch Kit (Portable Propane Torch, 14-02. fuel cylinders).	1	4	1	0	Store in end of building to assist in fire fighting.	A	Separate from class II flammables by 3' aisle space.	x	----	----	-----	3-4	
Sodium Acetate ..... -	0	0	0	0	No special handling . .	D	None	---	----	----	x	3-4	

Table 5-5. Hazardous Materials Storage and Handling Criteria--Continued

(See notes at end of table for explanation of codes.)

	Hazard Identity							Type of Storage Facilities					
	Health	Flammability	Reactivity	Specific Hazard	Storage and Handling	Storage Comp Group	Separation Requirement	Flamm Stge Bldg	Acid Stge Bldg	Comp Gas Stge Bldg	Gen Purpose Whse	Portable Fire Extinguisher Type	Class Liquid
Sodium Bicarbonate . . .	- i i -	- i i -	0	0	None ----------	D	*None* ----------	-----	-----	-----	X	N/A	
Sodium Bisulfate ------	3	0	0	E	None ----------	D	None ----------	-----	-----	-----	X	3-4	
Sodium Borate ---------	0	0	0	0	None ----------	D	None ----------	-----	-----	-----	X	3-4	
Sodium Bromide	1	0	1	E	No special handling ...	D	None ----------	-----	-----	-----	X	1-3-4	
Sodium Carbonate -----	0	0	0	0	None ----------	D	None ----------	-----	-----	-----	X	3-4	
Sodium Chlorate -------	—	0	2	D	Separate from other items.	D	3' aisle space ---------	-----	-----	-----	X	1	
Sodium Chloride -----	—	1	2	D	Separate from other items.	D	3' aisle space ----------	-----	-----	-----	X	1	
Sodium Cyanide -------	3	0	0	E	Separate from other items.	S	3' aisle space ---------	-----	-----	-----	X	1	
Sodium Hydrosulfite ..	3	1	2	E	Separate from other items.	D	3' aisle space --------	-----	-----	-----	X	1-3-4	
Sodium Hydroxide (Lye).	3	0	1	B	Separate from other items.	D	3' aisle space ----.---	-----	-----	-----	X	1	
Sodium Hyperchlorite .	2	1	0	D	Separate from other items.	D	3' aisle space --------	-----	-----	-----	X	1-3-4	
Sodium Hypophosphite	2	2	0	0	Separate from other items.	D	3' aisle space ----------	-----	-----	-----	X	1-3-4	
Sodium Nitrate --------	-----	0	2	D	Separate from other items.	D	3' aisle space ----------	-----	-----	-----	X	1	
Sodium Perchlorate ---	2	0	2	D	Separate from other items.	D	3' aisle space ----------	-----	-----	-----	X	1	
Sodium Peroxide ------	3	0	2	J	Separate from other items.	D	3' aisle space --------	-----	-----	-----	X	1-4	
Sodium Phosphate -----	2	0	0	0	No special handling ---	D	None ----.--.----------	-----	-----	-----	X	1-3-4	
SODIUM POTASSIUM ALLOYS.	3	3	2	E	Special facility and handling.	E							
Sodium Silicate --------	—	0	0	0	No special handling ---	D	None ----------	-----	-----	-----	X	N/A	
Sodium Sulfide	2	1	—	0	Separate from other items.	D	3' aisle space --------	-----	-----	-----	X	1	
Sodium Sulphate	0	0	0	0	No special handling ---	D	None ----------	-----	-----	-----	X	3-4	
Sodium Sulphite	1	0	1	H	No special handling ---	D	None ----------	-----	-----	-----	X	3-4	
Starter Fluid	2	4	1	0	Store in end of building.	A	3' aisle space from class II flammables.	x	-----	-----	-----	1-%4	
Stoddard Solvent (Dry cleaning).	2	3	0	0	Store with class II flammables.	A	4' space from class I flammables.	x	-----	-----	-----	3-4	II
Strontium Nitrate -----	1	0	1	D	Do not store on wood pallets.	D	3' aisle space --------	-----	-----	-----	X	1-3-4	

Strontium Peroxide ...	1	0	1	D	Do not store on wood pallets.	D	3' aisle space ---------	-----	-----	-----	X	1–4		
St yrene (monomer)	2	3	2	0	Store in end of building.	A	4' aisle space from class II flammables,	x		-----	-----	3–4	IC	
Sulfuric Ether (See Ether).														
Sulphur ----------	2	1	0	0	Separate from other items.	D	3' aisle space	-----	-----	-----	x	1		
Sulphur Dioxide -------	3	0	0	0	No combustible gas ...	C	Store with oxygen cylinders.	-----	-----	X	-----	N/A		
Sulphuric Acid -.--..---	3	0	1	K	Separate from other acids.	B	3' aisle space ---------	-----	X	-----	-----	1		
Talc ----------	See	el .-	-----	0	No special handling ---	D	None ----------	-----	-----	x	-----	3–4		
Tannic Acid	0	1	0	0	Separate from other items.	B	3' aisle space ---------	-----	X	-----	-----	3–4		
Tar Camphor (See Naphthalene).														
Tetraethyl Lead (TEL Compound).	3	2	3	0	Store with class 11 flammables.	A	3' aisle space from class I flammables.	X	-----	-----	-----	1–3–4		
Tetraethyl Lead (TML Compound).	3	3	3	0	Store in end of building.	A	3' aisle space	X	-----	-----	-----	1–3–4		
Tetra Hydrofuran -----	2	3	1	0	Store in end of building.	A	4' aisle space from class II flammables.	x	-----	-----	-----	2a–2–4	IB	
Tartaric Acid	0	1	0	0										
● Thorium Nitrate ------	1	0 ,	—	D	Separate from other items.	D	3' aisle space		-----	-----	x	1		
Toluene ----------	2	4	0	0	Store in end of building.	A	4'aisle space	x	-----	-----	-----	2,3,4	IB	
Toluene—Diisocyanate	2	1	2	E	Separate from class I flammables.	A	4' aisle space ---------	x	-----	.....	-----	3–4	IIIB	
Toluene—Methyl Isobutyl Ketone.	2	3	0	0	Store in end of building.	A	3' aisle space	X	-----	.....	.....	3–4		
Toluidines (Ortho, Para)	3	2	—	0	Separate from class I flammables.	A	4' aisle space . . -------	x	-----	-----	-----	3–4	111A	
Toluol (See Toluene).														
Triamylamine	2	1	0	0	Separate from class I flammables.	A	4' aisle space	X	-----	.....	-----	3–4	111A	
Tributylamine . . . ------	2	2	0	0	Separate from class 1 flammables.	A	4' aisle space ---------	x	-----	.....	-----	3–4	HIA	
Trichloroethane --------	2	0	0	0	No special handling ---	D	None ----------	-----	-----	-----	X	3–4		
Trichloroethylene ------	----	1	0	0	No special handling ---	D	None ----------	-----	-----	.....	X	3–4		
Trichlorofluoromethane	2	0	0	0	No special handling ..-	D	None ----------	-----	-----	-----	x	3–4		
Trichlorotrifluoroethane	2	0	0	0	No special handling ..-	D	None ----------	-----	-----	.....	x	3–4		
Triethanolamine . ------	1	1	1	0	No special handling ---	D	None ----------	-----	-----	.....	x	3–4		
Triethylamine	2	3	0	0	No special handling ...	D	4' aisle space ---------	-----	-----	-----	X	3–4	IB	
Triethelborane (See Diborane).														
Tricresyl Phosphate ...	2	1	0	0	No special handling ...	D	None ----------	-----	-----	.....	x	1,3,4		

Table 5-5. Hazardous Materials Storage and Handling Criteria—Continued

(See notes at end of table for explanation of codes.) . . . .

	Hazard Identity				Storage and, Handling	Storage Comp Group	Separation Requirement	Type of Storage Facilities				Portable Fire Extinguisher Type	Class Liquid
	Health	Flammability	Reactivity	specific Hazard				Flam Stge Bldg	Acid Stge Bldg	Comp Gas Stge Bldg	Gen Purpose Whse		
TRINITROBENZEN1	2	4	4	O	Special facility and handling.	E							
TRINITROTOLUENI (TNT).	2	4	4	0	Special facility and handling.	E							
Trisodium Phosphate	2	0	0	0	No special handling ---	D	None ----------	---	-----	-----	x	3-4	
Turpentine	1	3	0	0	Separate from class I flammables.	A	4' aisle space ---------	x	-----	-----	-----	3-4	IC
Unslaked Lime (See Calcium Oxide).													
Unsymmetrical Dimethylhydrazine.	3	4	1	0	Store in end of building.	A	4' aisle space from class I I flammables.	x	-----	-----	-----	3-4	IB
● Uranium Nitrate ---	—	0	1	D	Separate from other items.	D	3' aisle space ---------	---	-----	-----	x	1	
● Uranyl Acetate -----	1	0	1	0	No special handling ---	D	None ----------	---	-----	-----	x	3-4	
Varnish ----------	See k	l . .	-----	0	Nu special handling ---	D	None ----------	---	-----	-----	x	3-4	
Vinegar Acid (See Acetic Acid).													
Vinyl Acetate --------	2	4	2	O	Store in end of building.	A	4' aisle space from class 11 flammables.	x	-----	-----	-----	3-4	IB
Vinyl Benzene (See Styrene).													
Vinyl Chloride (Gas) .	-----	----	1	0	Separate from oxygen cylinders.	c	Separate building or solid compartment.	---	-----	x	-----	3-4	
Vinyl Ether ..... (Divinyl Ether) (Dichloethylene)	2	3	2	O	Store in end of building.	A	Separate from class J I flammables by 4' aisle space.	x	-----	-----	-----	3-4	IB
Vinylidene Chloride .	2	4	2	O	Store in end of building.	A	4' aisle space ---------	x	-----	-----	-----	3-4	IA
Xylenes (Ortho, Para Meta).	2	3	0	0	Store in end of building.	A	4' aisle space from class I 1 flammables.	x	-----	-----	-----	2-3-4	IC
Xylol (See Xylene).	2	4	0	O									
Water Glass (See Sodium Silicate).													
Zinc (Powder) --..-.-	—	1	1	()	Separate from other items.	D	3' aisle space	---	-----	.....	x	5	
Zinc Chlorate --------	2	0	2	D	Do not store on wood pallets.	D	3' aisle space		-----	-----	x	1-5	
Zinc Oxide ----------	1	0	0	()	No special handling . .	D	None	...	-----	-----	x	3-4	
Zinc Sulfide ----------	1	0	0	()	No special handling .-.	D	None	...	-----	-----	x	3-4	

Zirconium (Powder)	1	4	1	0	Separate from other items.	D	3' aisle space .-.--..--			-----	X	5	
Zinc Diethyl (See Diethylzinc).													
Zinc Ethyide (See Diethylzinc).													
Zinc Ethyl (See Diethylzinc).													

Notes.

1. *The following codes describe the health hazards.* **(A dash (—) means identity to be developed)**

Code	Explanation
4	*A few* whiffs *of the vapor could cause death, or the vapor or liquid could be fatal on penetrating the fire fighter's normal full protective clothing which is designed for resistance to heat. The normal full protective clothing available to the average fire department will not provide adequate protect ion against skin contact with these materials.*
3	*Materials extremely hazardous to health, but areas maybe entered with extreme care. Full protective clothing, including selfcontained breathing apparatus, rubber gloves, boots and bands around legs, arms and waist should be provided. No skin surface should be exposed.*
2	*Materials hazardous to health, but areas may be entered freely with selfcontained breathing apparatus.*
1	*Materials only slightly hazardous to health. It may be desirable to wear selfcontained breathing apparatus.*
0	*Materials which on exposure under fire conditions would offer no health hazard beyond that of* ordinary *combustible material.*

2. *The following codes describe the flammability hazards.*

Code	Explanation
4	**Very flammable gases, very volatile flammable liquids, and materials that in the form of dusts or mists readily form explosive mixtures when dispersed in air. Shut off flow of gas or liquid and keep cooling water streams on exposed tanks or containers. Use water spray carefully in the vicinity of dusts so as not to create dust clouds.**
3	**Liquids which can be ignited under almost all normal temperature conditions. Water may be effective on these liquids because of their low flash points. Solids which form coarse dusts, solids in shredded or fibrous form that create flash fires, solids that bum rapidly, usually because they contain their own oxygen, and any material that ignites spontaneously at normal temperatures in air.**
2	**Liquids which must be moderately heated before ignition will occur and solids that readily give off flammable vapors. Water spray may be used to extinguish the fire because the material can be cooled to below its flash point.**
1	**Materials that must be preheated before ignition can occur. Water may cause frothing of liquids' with this flammability rating number if it gets below the surface of the liquid and turns to steam. However, water spray gently applied to the surface will cause a frothing which will extinguish the fire. Most combustible solids have a flammability rating of 1.**
0	**Materials that will not burn.**

3. *The following codes describe the reactivity hazards.* **(A dash (—) means identity to be developed)**

Code	Explanation
4	**Materials which are readily capable of detonation or of explosive decomposition or explosive reaction at normal temperatures and pressures. Includes materials which are sensitive to mechanical or localized thermal shock. If a chemical with this hazard rating is in an advanced or massive fire, the area should be evacuated.**

code	*Explanation*
3	**Materials which are capable of detonation or of explosive decomposition or of explosive reaction,. but which require a strong initiating source or which must be heated under confinement before initiation. This includes materials which are sensitive to thermal or mechanical shock at elevated temperatures and pressures or which react explosively with water without, requiring heat or confinement. Fire fighting should be done from a protected location.**
2	**Materials which are normally unstable and readily undergo violent chemical change but do 'not detonate. This includes materials which can undergo violent chemical change at elevated temperatures and pressures, and materials "which may react violently with water or which may form potentially explosive mixtures with water. In advanced or massive tires, tire fighting should be done from a protected location.**
1	**Materials which are normally stable but which may become unstable at elevated temperatures and pressure or which may reactwith water with some release of energy, but not violently. Caution must be used in approaching the tire and applying water.**
0	**Materials which are normally stable even under *fire* exposure conditions and which are not reactive with water. Normal fire fighting procedures may be used.**

4. *The **following codes describe the specific hazards**.*

code	*Explanation*
A	**Corrosive Acid (ACID)**
B	**Corrosive Alkali (ALK)**
C	**Corrosive material other than acid and alkali (COR)**
D	**Oxidizing Material (OXY)**
E	**Use No Water in Fire Fighting (W*)**
F	**Corrosive Acid; Use No Water in Fire Fighting (ACID W*)**
G	**Corrosive Alkali; use no water in tire fighting (ALK W*)**
H	**Corrosive material other than acid and alkali; use no water in, fire fighting (COR W*)**
J	**Oxidizing material other than acid and alkali; use no water in fire fighting (OXY W*)**
K	**Oxidizing Acid (ACID OXY)**
L	**Oxidizing Alkali (ALK OXY)**
M	**Corrosive Oxidizing Material (COR OXY)**
N	**Corrosive Oxidizing Material; Use no water in tire fighting (COR OXY W*)**
0	**No specific hazard.**

"This symbol will include a dash on the identification label.

5. ***The following** codes **describe the storage compatibility group**.*

Code	*Explanation*
A	**Items in this group will be stored in the flammable storage building with separation as indicated in the Table of Hazardous Materials.**
B	**Items in this group will be stored in acid storage building, with separation as indicated in the Table of Hazardous Materials.**
C	**Items in this group will be stored in the compressed gas cylinder storage facility, with separation as indicated in the Table of Hazardous Materials.**

D	Items in this group may be stored in general purpose warehouse, with separation as indicated in the Table of Hazardous Materials.
E	Items in this group require special facilities and handling. Consult the installation Fire and Safety Officers and other appropriate personnel of the respective service for specific storage and fire protection requirements. ".
S	Items in this group shall be kept in a locked storage space accessible to authorized personnel only.
W	Items in this group shall be stored in a non-sprinkler protected space.

6. *The following codes describe the most suitable extinguishing agents in the form of portable extinguishers.*

Code	Extinguishing *Agent*
1	Water
2	Foam
2a	Alcohol Foam
3	Carbon Dioxide
4	Dry Chemical
5	Dry Chemical for Metal Fires

7. *The following codes describe the class liquids.*

Code	*Explanation*
1A	Liquids having flashpoints below 73° F (22.8° C) and having a boiling point below 100° F (37%' C).
IB	Liquids having flashpoints below 73° F (22.&C) and having a boiling point at or above 100" F (37.8° C).
IC	Liquids having flashpoints at or above 73" F. (22.8° C) and below 100° F (37.3" C).
11	Liquids with flashpoints at or above 100" F (37.8° C) and below 140° F (60 C) except anY mixture having components with flashpoints of 200° F (93.3" C) or higher, the volume of which make UP 99 percent or more of the mixture.
111	Liquids with flashpoints at or above 140° F (60° C).
111A	Liquids with flashpoints at or above 140° F (60° C) and below 200° F (93.3° C) except any mixture having components with flashpoints of 200° F (93.3° C) or higher, the total volume of which make UP 99 percent or more of the total volume of the mixture.
IIIB	Liquids with flashpoints at or above 300° F (93.3° C).